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OF THE

Geographical Society

OF

PHILADELPHIA

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VOL. II: MAY, 1896—DECEMBER, 1900.

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BULLETIN

OF THE

GEOGRAPHICAL CLUB

OF PHILADELPHIA

VOL. II. MAY, 1896. NO. 1.

VENEZUELA'S TERRITORIAL CLAIMS

FROM AN ADDRESS BY

JOSEPH B. AUSTIN

(Formerly U. S. Consul at Ciudad Bolivar)

FEBRUARY, 1896.

I went to the Orinoco River more than forty years ago, and at first held an official position under our Government. I had the opportunity of making an extended examination of the Upper Orinoco, the Apure and other rivers; and also made an expedition into the interior of the State of Guayana, through much of the territory now in dispute. During twenty-five years my connection with Venezuela was active and constant, and my travels and experiences within it wide and interesting. On my first visit my official headquarters were at Ciudad Bolivar, formerly Santo Tomas de Angostura (the Narrows), and best known, to club men at least, as the place where Dr. Siegert's Angostura bitters originated.

Here I found Major Mathison—British Consul to the Orinoco—then about sixty years of age, almost the whole of whose active life

had been spent in the service of the Foreign Office in that district and at Caracas. Probably no man then living had a more intimate knowledge of the history, condition and resources of the country. He had known, personally, many of the leaders in the War of Independence. He had married a Venezuelan lady, his home was there, and to a large extent his interests and sympathies also. He had been well acquainted with Sir Robert H. Schomburgk, the Prussian engineer appointed by the British Government to conduct the exploration of British Guiana and report upon its boundary lines, whose eight years' service in this expedition (1835 to 1844) had been closed but a few years before. Quite often the question of the boundary, and how it should be settled, was discussed between us in its various phases, but at this time the subject was mainly one of sentiment, due to an honest wish to close, in some satisfactory manner, a contention of such long standing—almost 150 years. No one then supposed the territory had any special value, least of all the Venezuelans themselves.

The missions of the Capuchins of Catalonia, in the northern and western edges of the region, had been broken up nearly forty years before, and even their buildings were disappearing in ruins.

In all the province east of the Caroni River and south of the Imataca Range there were but a few cattle estates—twenty, thirty, or even more leagues square—mostly on the elevated savannahs, where a sandy soil scantily covered with coarse grasses furnished ranges for a few thousands of small, wiry cattle, which were generally shipped off by way of the Orinoco River, at Las Tablas, to the British colonies of Demerara, Trinidad and Barbadoes. The country had no past worth any mention, except the destroyed missions; it certainly then had no present of any value; and its future was purely conjectural.

SPANISH DISCOVERY AND EXPLORATION.

Guayana may possibly have been sighted by Columbus on his third voyage in 1498; but his record of discovery on this voyage is the eastern coast of Cumana. He had entered the Gulf of Paria

from the south, and had noticed the violent and conflicting currents caused by the outflow of the Orinoco, but had not seen the river itself. Sailing northward, he skirted the promontory of Paria, without landing himself, sailed out of the northern "Bocas," and proceeded to Hispaniola.

Alonzo de Ojeda, who had been with Columbus in 1498, made an independent voyage in 1499, having with him Amerigo Vespucci, whose name was afterward given to the American Continents. This expedition made the land on the southern continent some two hundred leagues east of the Orinoco, entered the Gulf of Paria from the south, and sailed out of it again to the north and west, without having discovered the great river at all. It was this expedition which gave name to Venezuela—little Venice, the dwellings of the Indians on piles in the lake of Maracaibo suggesting to the Italian navigator the older Venice, on the lagoons of the Adriatic. The Orinoco was discovered by Vicente Yanez Pincon, in 1500, and was named by him, "Rio Dolce," (sweet water), from the volume of fresh water it carried out to sea.

Vasco Nuñez landed on the coast in 1504, and there seems then to have been a pause in exploration in this direction; but, in 1531, Diego de Ordaz entered the river and ascended it to the junction of the Meta; and the story of "El Dorado" soon after gaining currency and credence, he was followed by several expeditions, notably those of Alonzo de Herrera in 1533, and Antonio de Berrio in 1590. These facts of the discovery and exploration of the Orinoco and its delta by Spanish voyagers are incontestable, and have not been disputed by either Holland or Great Britain.

SPANISH OCCUPATION AND SETTLEMENT.

The Spanish occupation, other than their possessions along the "Spanish Main" and in the Caribbean Sea, was certainly confined to the immediate valley of the Orinoco River. Their first settlement of which I find record, was a fortified post on the island of Faxardo, opposite the mouth of the Caroni River, and called Santo

Tomas. This was nearly two hundred miles from the mouth of the river. It was founded in 1576, by the Jesuit Fathers Ignacio Llauri and Julian Vergara, and was taken by the Dutch under Captain Adrian Jansen in 1579, and held by him as a fortified position, some authorities say for three years, and others even longer; and it was destroyed when he evacuated it.

The next, also named Santo Tomas, was founded by Antonio de Berrio, in 1591, on the south bank of the river, about forty miles further down. This was evidently an unimportant place in 1595, when Sir Walter Raleigh passed up the river, for he went as far as the Caroni and makes no mention of it. It was stronger, however, in 1618, when Captain Keymis, acting under Sir Walter, attacked it with four hundred men; stormed, captured and sacked it; held it for several months, and destroyed it before evacuating. This second Santo Tomas is now known as Vieja Guayana, and consists of a couple of small forts and about a dozen mud huts.

The third Santo Tomas—de Angostura—now known as Ciudad Bolivar, was not founded until 1764. It is situated about three hundred miles from the mouth of the river, is the port of entry and export for the entire country drained by the Orinoco and its tributaries, contains about eight thousand inhabitants, and has always been the only town of any importance in the whole course of the river.

I have been unable to find any reliable authority for any attempt by Spain at penetration, occupancy, or settlement of the interior country, south of the Orinoco and *east of the Caroni*, previous to the eighteenth century. The missions of the Catalonian Capuchins in the valley of the Caroni River were not begun until 1724, though by the close of that century they had reached the drainage system of the Essequibo at some of their advanced stations. Father Caulin states that in his time, 1775, the entire Orinoco country east of the Caroni was a wilderness. The second Santo Tomas was not within the disputed territory, but strictly in the delta of the Orinoco. But even there they did not hold possession continuously. After the Dutch capture in 1579, Sir Walter Raleigh swept up the river like a whirl-

wind in 1595, landing at the mouth of the Caroni, meeting and feasting with the Casiques of the aboriginal tribes, showing them his portrait of Queen Elizabeth, receiving their pledges of allegiance to her, and promising to return with forces and arms to complete the occupancy of the country.

These Indians had certainly not been conquered by the Spaniards, and they were everywhere in active hostility to the pretensions of Spain.

Raleigh must have marched inland as far as the mountains of Santa Maria, just beyond the present town of Upata. From their summits he could overlook that wonderful view, closing to the south with the mountains beyond the Yuruari River, and including the auriferous district of the present day. His goal was in fair sight; but it was the height of the rainy season, the streams were all rising, and the Orinoco flooding the country far and wide and deep in his rear. He turned east, probably following that beautiful valley towards Palmar, still receiving the hospitalities and submission of the Casiques and their pledges of allegiance to the Virgin Queen, and must have regained his ships at or near Piacoa. He met no Spaniards, however, on his voyage up or down the Orinoco, nor during his march into the country. He sailed home to bear his part in the wars against Spain, and on the accession of James I, to enter on his twelve long years of imprisonment in the Tower of London.

On his second expedition, in 1617–18, remaining himself with his heavy vessels at the mouth of the Orinoco, to guard against a possible attack by a Spanish fleet (treachery at home having enabled Gondomar, the Spanish Ambassador at the Court of James I, to furnish to the Court of Spain information of the object and destination of the expedition), he despatched Captain Keymis to the capture and sack of Santo Tomas and the search for the gold mine.

This expedition, though successful from the military point of view, was a failure as a mining venture—the predecessor of a number of others in the same region in quite recent times; Keymis rejoined Sir Walter, and the expedition returned to England—

Raleigh, through the influence of the Spanish Ambassador, to be again committed to the Tower, and finally, in 1618, to the execution block in the old Palace Yard at Westminster. This closed the attacks on the Orinoco, either by Holland or England, leaving Spain in undisputed possession of its basin.

SPANISH CLAIMS TO TITLE.

Anterior to all discovery of this region were the conflicts between Spain and Portugal for the possession of the lands beyond the seas, both east and west, given to the knowledge of the world by their daring navigators.

Pope Martin V granted to the Crown of Portugal all lands it might discover from Cape Bojador, in Northwestern Africa, to the Indies; and the Spanish sovereigns engaged to respect this grant by treaty with Portugal, in 1479. Columbus reached Lisbon, on his return from his first voyage, March 4th, 1493, and on May 3d (or 4th), of the same year, Pope Alexander VI issued his famous "Bull" of demarcation, drawing a line from the North to the South Pole, one hundred leagues west of the Azores and Cape de Verde Islands, and granting all lands discovered west of it, and not taken possession of by any Christian power before the preceding Christmas, to Spain, and all east of it to Portugal. By the treaty of Tordesillas, June 7th, 1494, Spain and Portugal agreed to remove this Papal line of partition to three hundred and seventy leagues west of the Cape de Verde Islands; and this "Bull" and the subsequent treaty, form the basis of title always relied upon in the various disputes arising between the Catholic powers in the progress of discovery and occupation.

It seemed easy enough, then, to distribute territory which never belonged to the Sovereign Pontiff, but the Pope's "Bull" proved too sweeping in its provisions, and a later step in the formulation of a principle to regulate wholesale spoliations by superior power was found in the introduction into the code of international law of the provision—*doctrine* it would be called now—that possession and set-

tlement at the mouth of a river, when the interior country was inhabited by savage tribes, carried with it *ipso facto* the ownership of the entire drainage system of that river—the main stream, with all its tributary streams and all the territory adjacent to them, whether occupied or not by immediate settlement.

The Germans have revived this in their claim to the "Hinterland," as applied to their African acquisitions; and it has been asserted and maintained at various periods in official acts and papers of the Washington Government.

Time does not permit reference to early authorities on international law, but I will cite Creasy's "First Platform of International Law, "pp. 216-218, which says:

"Questions as to the extent of territory which is gained by the occupation of a part thereof have often arisen and have proved sometimes hard of solution. . . . Three rules on this subject were propounded and maintained by the Commissioners of the United States in the negotiations conducted by them in 1817 with the Commissioners of Spain in regard to the western boundary of Louisiana. These principles, say the Commissioners, have been adopted in practice by the European Powers as applicable to the discoveries and acquisitions made in the New World. They are few, simple, and intelligible, and at the same time are founded in strict justice.

"(1.) When any European nation takes possession of any extent of seacoast, that possession is understood as extending into the interior country to the sources of the rivers emptying themselves within that coast, to all their branches and to the country they cover, and to give it a right in exclusion of all other nations to the same.

"(2.) Whenever one European nation makes a discovery and takes possession of any part of that continent, and another afterwards does the same at some distance from it, where the boundary between them is not determined by the principle above mentioned the middle distance becomes such of course"

Of like tenor are Secretary Calhoun's words to Mr. Pakenham (Wharton's Digest, vol. i, p. 6): ". . . So likewise, in the case of a river, it has been usual to extend the claim of territory to the entire region drained by it, more especially in the case of a discovery and settlement at the river's mouth." Moreover, in 1872, Secretary Fish wrote to Mr. Preston: "Discovery alone is not enough to give dominion and jurisdiction. . . . Such discovery must be followed by possession."

Now Columbus certainly did not discover Guayana, nor did Ojeda. Ordaz may have sighted the low, mangrove-skirted coast during his voyage northward in 1531, but he made no landing upon it until within the waters of the Orinoco. Nor, at any time then or thereafter, had the Crown of Spain any possession, foothold, military post or settlement in the entire region comprised in the coast line from the mouth of the Orinoco to the Essequibo, or upon any of the rivers emptying into the Atlantic along that coast line. The Caribs, who dominated the district, always bitterly hostile to the Spaniards and never conquered by them, were in friendly alliance with the Dutch. It was designated on the old maps, and referred to in the books and documents of the time, as "Caribana," and was as absolutely sealed against a Spaniard as the Kingdom of Heaven is supposed to be against unbelievers. But the most Catholic kings had extended views of their possessory rights; the Pope had given them the Earth and they intended to hold it, if it could be effected on paper by "Royal Orders," or by cartography. By the "Royal Order" of Aranjuez, March 5th, 1768, the limits of the Province of Guayana were defined as "bounded by the Amazon River on the south and the Atlantic Ocean on the east"—the whole of Caribana and all the territory now included in the Brazilian, French, Dutch and British Guianas.

Another "Royal Order," only a few years later, in 1780, defined Spanish Guayana as "commencing at the windward of the fall of the Orinoco River into the sea, on the border of the Dutch colony of Essequibo." This order really admits the entire British contention of the present day, as the successor of Holland in possession. The fact is that these worthy kings had very little idea as to what really did belong to them. During two centuries of stirring times by sea and land along those coasts, Portugal, Holland, France and England had been going steadily ahead, colonizing, cultivating and developing their possessions, pausing now and then to have some fighting and destroy much of what they had built up, and then making cessions, treaties and new distributions between themselves

the colonists returned to their legitimate business of raising sugar cane and trading with the Indians of the interior.

Bruzen de la Martinière, in his "Dictionnaire Géographique," published in Venice in 1737 (vol. v, p. 334), says: "The French possess the land from the North Cape to the River Marony, and the Dutch from that point to the Orinoco."

In 1759, and again in 1769, the States General of Holland addressed remonstrances to the Court of Madrid against the Spanish incursions into the basin of the Cuyuni, and these remained without defense—presumably because there was none to be made.

In February, 1781, the Dutch colonies were captured by the English, under Admiral Rodney, for the second time; England being then at war with Holland, Spain, France and the North American colonies.

In 1782 they were taken from England by France, by an expedition sent out expressly for the purpose. At the peace of 1783 they were restored by France to Holland.

In 1796 they surrendered again to England—the third time.

In 1797 the Spaniards made an attack on the post on the Moroco River, but were repulsed with heavy losses, very few escaping alive.

In 1802 they were returned to Holland, at the peace of Amiens.

In 1803 (September 17th) the English were again in possession for the fourth time, which was confirmed by the treaty of London, August 13th, 1814, embracing the colonies of Berbice, Demerara and Essequibo, and constituting the present colony of British Guiana.

The contention that the term Essequibo did not include all the territory occupied by the Dutch, and administered by them from their colonial headquarters on that river, a possession extending over two centuries, is both untenable and absurd—a mere quibble of words.

In 1786 Alcedo, a Spanish historian and geographer of prominence, gives the Pomeroon River as the western limit of Dutch Guiana, and states their possession of the forts on the Essequibo and

the territory on the Cuyuni and Mazaruni Rivers. Depous, the French traveler in the Guianas in 1801–2–3–4, states that while on the maps Spanish Guayana seems to occupy part of the coast line south of the Orinoco, in reality she does not occupy one inch of it; and mentions the Dutch forts on the coast, at the junction of the Mazaruni and the Essequibo, an advanced garrison on the Cuyuni, the extent of their settlements to the north and west of the Essequibo, and their full possession as far as Cape Nassau.

While the Indian names were generally retained for the rivers and mountains, those of the settlements and plantations were almost invariably Dutch.

If these facts do not constitute proof of occupation, settlement and firm possession, it is difficult to imagine any stronger, for there is shown continuous occupation and administration for over two centuries, and the *only* occupation and administration ever existing there.

PRESENT CLAIMS.

The revolutionary party in Venezuela declared its independence from Spain on July 5th, 1811. Though moderately successful at first, the power of Spain was soon re-established, and it was not until 1817, that Bolivar, aided by the tacit connivance of the United States and Great Britain, and the material supplies of men and arms from the latter, made his successful campaign by the line of the Orinoco River, opening up an advance into the interior, and at the crowning battle of Carabobo, in 1820, securing the independence. In 1823 the United States and Great Britain recognized the new State, and the celebrated "Monroe Doctrine" was promulgated December 2d of that year; but the independence of Venezuela was not formally recognized by Spain until the treaty of 1845. From this period dates the interest of Venezuela in this question. The Republic became successor to the rights of the Crown of Spain, and those covered whatever was held by occupation, settlement and administration;—not what the Pope gave in 1493, nor what a king *said he had* by "Royal Order" in 1768, but what was held, occupied, or administered by Spain.

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Sir Robert H. Schomburgk, who conducted the exploration of Guiana during eight years, 1835 to 1844, was undoubtedly a most capable and accomplished man personally, and his expedition the best equipped, ever sent into this territory. A Prussian by birth, and a thoroughly educated engineer, he evidently, though acting under the authority of the British Government, aimed to make a fair and honest delineation. He was not biased by the desire to include any gold-bearing district within his lines, for, writing in 1848, he says: "It cannot be doubted that Guiana possesses gold; there are various instances on record of this metal being found; but none where it has been met with in sufficient quantities to render its working profitable:" in this confirming Baron von Humboldt, who, writing in 1801, says: "No man in Europe believes any longer in the wealth of Guiana and the empire of the Grand Patiti." The auriferous territory developed since 1853 is entirely outside of his boundary line.

Schomburgk's line was eminently one of compromise. He waived entirely the theory of "Hinterland," or the extreme drainage system of the Essequibo, and accepted only such limits as were clearly demonstrated to have been occupied and held by the Dutch before the cession to Great Britain.

That this line would have been accepted by England is abundantly proved by the correspondence of their Foreign Office, up to a quite recent date; and it has been due to the overgrasping and untenable claims of the Venezuelan politicians in extending their limits down to the western banks of the Essequibo, that the British Foreign Office, wearied with such persistent though childish pretensions, based on nothing more substantial than Papal "Bulls" and conflicting "Royal Orders," has finally asserted its rights under international law to claim the entire territory embraced in the drainage system of the Essequibo.

It is a significant fact in this connection that the modern German cartographers, probably the best and most careful in our time, have

Charles II. In 1665, during the wars between Holland and England, Lord Willoughby, then Governor of Barbadoes, despatched an expedition against the Dutch colonies, and at that time their boundaries were expressed as "all that part of Guiana abutting on the Atlantic Ocean from Cayan on the southeast, to Orinoco on the northwest, except a small colony on the River Berbice."

In 1687 there was a Dutch fort at Cape Nassau.

In 1669 Dutch Guiana covered all the territory now divided into British, Dutch and French Guiana. Their principal settlements, however, were upon the Essequibo River. Upon "Flag Island," in that river, they had a stone fort ("Zelandia") mounting twenty guns, with a water battery mounting twelve heavy pieces. Here was a town—Duinenberg—where the governor and colonial officials lived, and many large plantations under cultivation. There were two parishes between the Essequibo and Pomeroon Rivers—St. John and Trinity; New Zealand and New Middleburgh, towns on the Pomeroon; a military post on the Moroco; and forty-nine estates in cultivation of sugar cane, coffee and cotton.

On the Cuyuni River they had settlements many miles up, upon two islands called Great and Little Batavia; and a fortified post a hundred and fifty miles further inland, which must have been the same that my party often heard of from the Indians on the Yuruari, as at the junction of the Cuyuni and Yuruari Rivers.

Upon the Essequibo they had plantations on both banks, and an outpost at Arinda, near the great cataracts. In short, along the entire coast and for varying distances inland along water courses, they had flourishing plantations and towns and fortified posts, from Point Barima at the southern mouth of the Orinoco including Caño Paraman, and on the Moroco, Pomeroon, Essequibo, Cuyuni, Mazaruni, Demerara and Berbice Rivers.

In 1721 the Council of Ten, in Holland, granted a privilege to work mines in Guiana, and one Hildebrand was sent out to superintend the mining. Under his direction a shaft was sunk near the first cataract of the Cuyuni. The venture, however, did not pay, and

the colonists returned to their legitimate business of raising sugar cane and trading with the Indians of the interior.

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Great Britain, as the successor of Holland, has been in quiet and peaceable possession since 1803—long antedating the real existence of the Republic of Venezuela. The number of British subjects domiciled west and north of the course of the Essequibo River, in the territory now claimed by Venezuela, amounts to some thousands (claimed by some English sources as forty thousand, but this is undoubtedly an exaggerated estimate), living under the just, orderly, free administration of the British Empire.

MAPS.

The early maps of this country were largely imaginative, and followed the prevailing fables of the time concerning it, their central idea being the existence of Lake Parime and the empire of "El Dorado." These were introduced somewhat at the fancy of the old map-makers, and then the mountain ranges and the sources and courses of rivers were inserted to conform to them.

We know now that no lake exists there; that the great backbone of the mountain system is the Pacaraima range, eight thousand feet in elevation; and that in this and the somewhat lower Parime range, all the great rivers, Essequibo, Rio Negro, Ventuari, Orinoco, Caura, Paragua and Caroni, find their direct sources and their principal affluents.

Other geographers introduce the city of Manoa, and also Lake Cassipa, and one, I remember, shows the Caura, the Arui and the Caroni Rivers, all flowing out of it.

For three centuries these lakes held their positions on the maps, sometimes shifted a little east or west, but always there; and they were only abandoned by the map-makers towards the close of the eighteenth century. Names of mountains and rivers were caught by ear from the Indians and spelled at the fancy of the geographer; and having no exact determination of important points by survey, or observation for latitude and longitude, naturally enough the whole cartographic work of those early days is without authority and often misleading.

At the time of Baron von Humboldt's visit, in 1801, he says "no astronomical observation had ever been made of the country for eight degrees south of Santo Tomas de Angostura," and I very much doubt if any have been made since, except by Sir Robert H. Schomburgk. Humboldt did not extend his travels in this direction beyond Santo Tomas de Angostura, having been refused permission to visit the missions of the Caroni; and his maps of the country, beyond his own line of travel, were only copies of the existing Spanish authorities.

The maps issued from these and from Venezuelan sources are about as reliable on boundaries as the ordinary trunk-line railway maps of our time-tables are on curvature. Therefore, to form a just conception of the probable territorial limits of these early times, it is necessary to consult independent sources, free from the conflicting interests of both Spain and Holland; and here the weight of evidence is decidedly against the claims of Venezuela. They generally show the territory of Holland as extending to the mouth of the Orinoco and covering a considerable portion of the drainage system of the Essequibo, some even carrying the line so as to embrace the whole of that system. Of the many in existence I will name only a few of the more important ones:

1669. Sanson, "Amerique Meridionale." French.

1750. Popple's "Portuguese America."

1752. Kitchen's "General Atlas of the World." London.

1774. Delisle, First Geographer to the King, and made for Louis XV.

1776. Sir Janvier. Printed in Venice.

1781. Bew. London.

1781. Thompson. Coast Charts by Capt. Edw. Thompson, R. N., executed by De la Rochette, October, 1783.

And finally a very curious map by Major F. von Bouchenroeder, published in Amsterdam in 1[illegible]3, and giving the dividing line almost identically as recommen[illegible] Schomburgk som[illegible] years later.

Sir Robert H. Schomburgk, who conducted the exploration of Guiana during eight years, 1835 to 1844, was undoubtedly a most capable and accomplished man personally, and his expedition the best equipped, ever sent into this territory. A Prussian by birth, and a thoroughly educated engineer, he evidently, though acting under the authority of the British Government, aimed to make a fair and honest delineation. He was not biased by the desire to include any gold-bearing district within his lines, for, writing in 1848, he says: "It cannot be doubted that Guiana possesses gold; there are various instances on record of this metal being found; but none where it has been met with in sufficient quantities to render its working profitable:" in this confirming Baron von Humboldt, who, writing in 1801, says: "No man in Europe believes any longer in the wealth of Guiana and the empire of the Grand Patiti." The auriferous territory developed since 1853 is entirely outside of his boundary line.

Schomburgk's line was eminently one of compromise. He waived entirely the theory of "Hinterland," or the extreme drainage system of the Essequibo, and accepted only such limits as were clearly demonstrated to have been occupied and held by the Dutch before the cession to Great Britain.

That this line would have been accepted by England is abundantly proved by the correspondence of their Foreign Office, up to a quite recent date; and it has been due to the overgrasping and untenable claims of the Venezuelan politicians in extending their limits down to the western banks of the Essequibo, that the British Foreign Office, wearied with such persistent though childish pretensions, based on nothing more substantial than Papal "Bulls" and conflicting "Royal Orders," has finally asserted its rights under international law to claim the entire territory embraced in the drainage system of the Essequibo.

It is a significant fact in this connection that the modern German cartographers, probably t[illegible] and most careful in our time, have

generally united in giving Point Barima, at the southern mouth of the Orinoco, as the northern limit of British Guiana.

The idea prevails extensively in our country, that these Spanish American States have an identity of sympathies and institutions with ourselves. They are called Republics, and hence are supposed to be such; but nothing could be more erroneous. With the exception of Mexico, which has improved immensely under the wise rule of President Diaz, they are in the main only military dictatorships masquerading under the guise of Constitutional States. The suffrage is a farce. An almost continuous succession of revolutions saps the patriotism and the morals of their people. Their chiefs, posing as presidents, aim usually at personal enrichment and then luxurious residence elsewhere, after their excesses have forced them to give way to the fresh hungry crew always on hand to secure power, only to repeat the same process of depletion. There is no real sympathy with the people or the institutions of our United States. When oppression and extortion and outrages on the persons or property of foreigners drive one or another of the European Powers to interfere for the protection of its subjects, then, and then only, comes the cry for the assistance of the "hermana mayor"—the elder sister—the great Republic of the North.

Venezuela has been pre-eminent among them for outrages on American citizens. Its diplomacy has been most irritating, both to our government and to the European Powers, but its appeals to us become insistent only when Holland, France, Spain or Great Britain, having exhausted diplomatic efforts, threatens to resort to force to obtain recognition of just demands. With a population of less than two millions (there has never been any reliable enumeration) not one per cent. are pure whites, the rest being black, red, yellow [illegible] all the infinite gradations of color in a mixed race. It is a [illegible] of revolution, and has been so ever since its separation [illegible] one military chief after another grasping supreme [illegible] and then one being strong enough to secure a [illegible]

internal tranquillity and keep the others out of the public "crib" while fattening himself.

Admiral the Earl of Dundonald (fighting Lord Cochrane), after spending much of his life in the naval service of the South American States during their wars of independence, was afterwards reinstated in the British Navy, and held command of the West India Station. On one occasion he went with his flag-ship to La Guayra to demand redress for some outrages on British subjects. He met with the usual round of delays and prevarications, and the blunt old sailor, knowing the people he had to deal with, finally gave them twenty-four hours in which to pay or submit to bombardment. The money was paid, with the usual protest of submission only to superior power; and the Admiral then told them that small nations were very much like small boys, and must be taught by punishment that they could not perpetrate outrages with impunity, by taking refuge behind their weakness, as women and children did.

A favorite subject of newspaper discussion has been the strong strategic position of Point Barima at the mouth of the Orinoco, since it commands the vast interior water communications and commerce of the northern part of the South American continent. But truly it requires the imagination of a Venezuelan to discover the vast importance of the Orinoco as a medium of communication with the interior of South America. And what is the commerce that will be dominated from Punta Barima?

Ten or twelve small vessels of about three hundred tons burthen go out each year from American ports to Ciudad Bolivar, carrying breadstuffs, lumber, "notions," some machinery, and assorted cargoes; and about half a dozen come from Europe each year, with dry goods, wines and liquors, and fancy articles; and this is all that passes [illegible] Barima. [illegible] small steamer runs every fortnight between [illegible] with the mails, passengers and fifty or [illegible] through the Caño Macareo into the [illegible]. Another small river steamer [illegible] from Ciudad Bolivar up the

Orinoco and Apure Rivers, to Nutrias, making, possibly, six or eight trips a year. The exports are a few thousand hides and deerskins, some coffee, tobacco, indigo, cocoa, india rubber, tonga beans and balsam copaiva.

That is all the commerce; and under the incessant revolutions, which have been the rule instead of the exception, since 1850, the population and production of the Orinoco basin have both steadily diminished.

The river itself is not a steady medium of communication. Its only seaport is three hundred miles from the sea. At several points on the lower river, bars obstruct the navigation; sometimes not admitting the passage of vessels drawing over nine feet of water. Above Ciudad Bolivar, the bars are more frequent and the depth of water less. At Atures and Maypures, cataracts and rapids entirely close the river to navigation, and require long and difficult portages. And though it is true that by the natural canal of the Cassiquiare, water communication exists between the Upper Orinoco and the Rio Negro, which is one of the great tributaries of the Amazon, yet for all practical purposes this is worthless—a mere geographical curiosity—for the Rio Negro is so obstructed by rapids and cataracts that it is only navigable by canoes and under great difficulties.

The valley of the Orinoco is practically a wilderness. You sail day after day without seeing a trace of inhabitants or cultivation. It is absolutely unfit for colonization. Attempts have been made from time to time to introduce immigration from Europe, and, at the close of the American Civil War, several parties of emigrants from the South attempted settlements under grants from the Venezuelan Government; but in every case the result was disastrous. Shattered by fevers, and after suffering untold miseries, the few survivors were compelled to accept the charitable assistance of strangers [illegible] their homes.

These boundary questions seem co-extensive [illegible] entire South American Continent, in which [illegible] seldom been closely or accurately defined. [illegible]

"These descimentos are nothing more or less than incursions of the Brazilian militia from the Amazons and Negro to surprise the Indian settlements by night, and to carry off the inhabitants into slavery. I was at Fort San Joaquim when such an expedition arrived, which had surprised some Wapisiana settlements at the Takuta by night, set on fire their habitations, and carried upwards of forty individuals, men, women and children, of all ages, into slavery. It may be questionable if the enslaved parties were not British subjects: whether they were or not depends on the yet undetermined line of the boundary of British Guayana. I am happy to say that many of them were afterwards liberated upon my appeal, through Don Pedro Ayres, to the authorities: some died at the Rio Negro, and others were never accounted for. An accident which befel my coxswain obliged me to make a longer stay in Pirara than I intended; this delay was the more irskome, as the weather was unfavourable for astronomical observations." [2]

The map constructed by Mr. Schomburgk after the completion of his final explorations, and deposited with the British Colonial Office, is based upon a large number of determinations for latitude and longitude; the statement is thus made [3] by the traveler himself:

"The general map of British Guayana which I have constructed from my exploratory expeditions is based upon the following data, viz., the determination of the latitude of 174 different points, obtained by 4824 altitudes of heavenly bodies, and the determination of hour angles for meridian distances, and the rate of the chronometers for 223 different stations, ascertained by 5801 altitudes of the sun or stars."

The writer has, regretfully, been unable to obtain access to an official copy of this map, nor, in fact, does the map appear to have been published or issued before the period of the last eighteen months or so. It, doubtless, contains the boundary line which was recommended by Schomburgk to the British Government, and which, in more or less accord, was traced by him across the actual face of the country. A number of preliminary or subordinate maps, illustrating the earlier explorations, had previously been published by the Royal Geographical Society, but

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[2] Journey from San Joaquim, on the Rio Branco, to Roraima, and thence by the Rivers Parima and Merewari to Esmeralda, on the Orinoco, in 1838-9.
Journal Royal Geographical Society, 1841, pp. 193-194.

[3] Journal Expedition from Pirara to the Upper Corentyn. *Journ. R. G. S.*, vol 15, p. 102, 1845.

NOTES UPON THE SCHOMBURGK LINE AND THE GUAYANA BOUNDARY.

By PROF. ANGELO HEILPRIN,
Vice-President Geographical Club of Philadelphia.

The few fragmentary paragraphs that here follow are not intended as an exposition of our knowledge of the Schomburgk Line and of the boundary which it is assumed to define, but merely as a contribution to such knowledge—a contribution, again, not obtained from new and original sources, but from material that has been noted and recorded for a period of quite, or nearly, a half-century. The Schomburgk Line, as is well known, derives its name from its association with the distinguished Prussian traveler, Robert (afterwards Sir Robert) Hermann Schomburgk, by whom the materials for its construction were obtained. The better part of four years' service (1835-39) spent in the wilds of Guayana, almost exclusively in the execution of exploratory work entrusted to him by the Royal Geographical Society of London, well fitted this able traveler for the official task that was now imposed upon him by a government—the delineation of a boundary. Previous to Schomburgk's explorations not much more was known of the interior of Guayana than was known at the same time of the heart of Africa, and even to-day the works and maps of the brothers Schomburgk (Robert and Richard) remain as the main source of information of that still primitive country, and the one repository of facts regarding the natural history of the region. Richard Schomburgk's *Reisen in Britisch Guiana* is a befitting supplement to Humboldt's great work on Spanish America.

Two travelers of note, Barrington Brown and Im Thurn, have penetrated the region during the last quarter of the century, but their observations do not add very much to the sum of knowledge which had been gathered in by the Prussian travelers; exception

must be made in one particular, the adjusting of the true course of the Mazaruni River, the upper course of which has been shown by Brown to lie at least a half a degree further north than appears in Schomburgk's map. To Im Thurn, again, we owe the conquest of that assumedly impregnable mountain-summit, Roraima. Brown accepts [1] with little modification Schomburgk's map, and as he was an official Government Surveyor (of British Guayana), it may be taken as evidence of the general accuracy of its parts.

The following appears to be an official minute bearing upon Mr. Schomburgk's conduct of the boundary work; it is from a Parliamentary Paper dated May 11th, 1840, and gives the real object of the traveler's work:

FOREIGN OFFICE, 18 March, 1840.

SIR:—I am directed by Viscount Palmerston to acknowledge the receipt of your letter of the 6th instant, enclosing copies and extracts of despatches and their enclosures from Mr. Light, Governor of British Guiana, relative to the expediency of an arrangement being made with the Brazilian, Venezuelan and Netherland governments, by which the boundaries of British Guiana may be accurately defined.

With reference to that part of your letter in which you state that Lord John Russell considers it to be important that the boundaries of British Guiana should be ascertained and agreed upon, if possible, and that Mr. Schomburgk's researches in those parts have qualified him in a peculiar manner to be of use, should the services of any person acquainted with the geography of British Guiana be required for fixing the boundaries of the British territory, I am to state to you, that the course of proceeding which Lord Palmerston would suggest for the consideration of Lord John Russell is, that a map of British Guiana should be made out according to the boundaries described by Mr. Schomburgk; that the said map should be accompanied by a memoir, describing in detail the natural features which define and constitute the boundaries in question; and that copies of that map and memoir should be delivered to the governments of Venezuela, of Brazil, and of the Netherlands, as a statement of the British claim. That in the meanwhile British commissioners should be sent to erect landmarks on the ground, in order to mark out by permanent erections the line of boundary so claimed by Great Britain. It would then rest with each of the three governments above mentioned to make any objection which they might have to bring forward against these boundaries, and to state the reasons upon which such objections might be founded, and

[1] Canoe and Camp-Life in British Guiana, 1876.

upon the Schomburgk data, place the Guayana-Venezuela boundary well within the Cuyuni River, or to the eastward of the mountain-spurs which take a north-and-south trend approximately on the meridian of 61° 15′–61° 30′ W. The map published by Richard Schomburgk is significant in this connection. It bears the date of 1846, and is, therefore, of a time when controversy over the staking and drawing of the line had been full and ripe. In its construction Herr Mahlmann informs us that for the region east of longitude 62° 18′ W. he has used mainly the data contained in the official map of Sir Robert Schomburgk, on a scale of 1 : 440,000, deposited in the Colonial Office of London, compared and corrected with the reports of exploration contained in the Journal of the Royal Geographical Society and with those of Hilhouse (for the Mazaruni) and Richard Schomburgk. On this map, as well as in most subsequent maps—like those of Bartholomew, Stieler, Andree, Brockhaus, etc.—the Cuyuni River forms no part of the boundary, but cuts at almost right angles the Schomburgk Line in latitude 6° 45′ N. and longitude 60° 10′ W. (approx.). This would make it appear that the original Colonial Office map was different from the one that has recently been issued; the changes may, however, well have been suggested by Schomburgk in the early days of controversy, and they have so modified the line, as to give it—as has already been intimated—a different official interpretation for the several governments that are parties to the controversy.

That Schomburgk himself, whatever may have been his recommendation to the English Government, did *not* draw a line in which the Cuyuni was a part of the boundary is made almost certain, not only by the elaborate map published by his brother (taken from his own sources)—which, as has just been seen, gives a very different line—but by the main facts as they appear on the official British (Schomburgk or Colonial Office) map, and as they are cited by Mr. Markham in his very clear analysis of this map. We extract the following from the review of the distinguished President of the Royal Geographical Society:

"In 1840 Schomburgk received the gold medal of the Royal Geographical Society, and in the following year he became Her Majesty's Commissioner to survey the boundaries of British Guiana. He explored the Waimi and Barima, and delineated a boundary by which a large extent of British territory, comprising the whole valley of the Yuruari, was given up to Venezuela. Even then the Venezuelans had commenced their encroachments into British territory, and the line was designed to satisfy them and to secure a good understanding. The line was drawn on a just and well-defined principle, conceding to Venezuela the Yuruari and Curumu valleys, which had been occupied by the Venezuelans, and retaining the territory which had never been occupied by Spaniards or Venezuelans. The line commences at the mouth of the Amacura, on territory which had belonged to Holland since 1621, follows that river to its source, includes the basins of the Barima and Barama, and then follows down the Akrabisi to its junction with the Cuyuni. That river, then, becomes the boundary to its source. A first and a second Schomburgk line has been shown on maps, and this has been interpreted as vacillation. But there has been no change in the line itself, as explained above. The change on the maps is merely due to variations rendered necessary by more recent discoveries and more accurate surveys. Five of Schomburgk's maps were published in the Journals of the Royal Geographical Society; and a very excellent map of British Guiana, compiled from them on a scale of seven miles to an inch, was engraved in 1875. Sir Robert Schomburgk also drew an excellent map for the edition of Raleigh's 'Guiana' which he edited for the Hakluyt Society."[5]

"It is important to explain the mistake about the first and second Schomburgk Lines. In reality there is one Schomburgk Line only. In 1840 Schomburgk published a small volume entitled 'Description of British Guiana,' illustrated by a map drawn by Mr. Arrowsmith. The map itself was drawn on Schomburgk's authority before returning to Guiana. But there is a red line across it to represent 'the boundary as claimed by Great Britain,' for which Mr. Arrowsmith is solely responsible. It is officially repudiated, and is of no authority. Schomburgk had nothing to do with it. The proof of this is that the same line appears on Arrowsmith's map, in his Atlas of 1832. It is erroneously called the first Schomburgk Line, and has often been copied.

"The true Schomburgk Line is shown on the official map. The portion from the mouth of the Amakura to the junction of the Akarabisi with the Cuyuni was discovered and surveyed by Schomburgk himself in 1841. The portion about Mount Roraima, as far as Mount Irutibuh, was also surveyed by Schomburgk. The rest, following the Cuyuni River, is drawn in accordance with the proposal in his report. When Sir Robert Schomburgk completed his surveys he sent in six reports, and compiled two maps which have never been published. His own maps, on a very

[5] Boundaries of British Guiana—the evidence of maps. By Clements R. Markham. *Geographical Journal*, March, 1896, p. 280.

large scale, only carried the line to the junction of the Akarabisi with the Cuyuni. All this material was placed in the hands of Mr. Hebert, of the Quarter-Master General's Department at the Horse Guards, who compiled a beautiful map, showing the complete Schomburgk Line, in 1842. This map was lithographed in 1887. It was compiled exclusively from Schomburgk's materials. Copies of this official map, in two sheets, have now been presented to the Royal Geographical Society."[6]

The two points made particularly clear here are: (1) That Schomburgk did not himself complete the official map, and (2) that the Schomburgk Line as actually drawn by him did not pass beyond the point of junction of the Acarabisi with the Cuyuni. This, doubtless, explains why the greater number of geographers do not recognize the Cuyuni as part of the boundary-line, any more than Richard Schomburgk did in 1846.

Without entering into a further analysis of the Schomburgk Line as it is, or is not, now understood, it may be appropriate to ascertain what was the *geographical* feeling regarding the extent of the British possessions at about the time that the explorations in question were being conducted, and no expression could perhaps represent more respectable authority than that of the Royal Geographical Society. In the instructions given by the Council of this Society to its representative (Schomburgk) we find the following:

"Accordingly, the Council wishes you to understand most distinctly, that, for the first year, or eighteen months, everything is to be subordinate to the object of thoroughly investigating the physical character and resources of that portion of the central ridge traversing this part of South America, which furnishes tributaries to the Demerara, Essequibo and other rivers flowing into the Atlantic, within or immediately contiguous to the British colony of Guiana. The limits of this may be roughly defined to be the meridians of 55° and 62° west longitude from Greenwich."[7]

The claim to territory here is thus extended westward to about the 62d meridian of longitude, which lies beyond the furthest curve of the Cuyuni, and which would seem to make good the present

[6] *Geographical Journal*, March, 1896, p. 309.

[7] Report of Council, May 16th, 1836.

contention. But we find in the same report, in the following disapproval of a part of the expedition as planned, a disavowal of British possession along the upper Cuyuni River:

"Your proposed expedition up the Cuyuny to explore the Sierra Imataca would be interesting, if practicable with a due attention to the other objects of the expedition. But as this district is not within British Guiana, and a minute knowledge of it would not further your ulterior views,—besides which, it is easily accessible at any time, and its investigation now would cause an expense which might be inconvenient,—it must not be made a first object. With regard to it you should be guided entirely by the opinions and advice which you may receive, particularly from Sir Carmichael Smyth, at Demerara."

(Signed) A. MACONOCHIE.

It is, however, true that the scant knowledge that at the time existed regarding the Imataca Mountains may have placed them, in the opinions of geographers, far beyond the region where some of their ridges or spurs are now known to exist, and perhaps little weight can be attached to the acknowledgment or supposition that they were situated entirely beyond recognized British territory.

While much has been said regarding the actual extension westwards of the British territory, the matter of the southern or Brazilian boundary has received but little attention. Concerning this there is no disposition to raise question, nor is it likely that such will be raised in a near future. Yet it is interesting to note that the position of this as it is recognized to-day, and as it appears delineated on the maps immediately after the completion of the labors of the brothers Schomburgk, is very different from what it was assumed by geographers to be when Schomburgk started out on his explorations. The following extracts from his journal and from the Report of the Council of the Royal Geographical Society best illustrate this point:

"A few miles farther, we reached the rivulet Annay, flowing from the northern hills, and falling into the Rupunoony, where it makes an elbow, and turns to the south; and this rivulet, on what authority I know not, is usually considered the boundary between the British and Portuguese possessions on the Rupunoony. Latitude 3° 52′ 30″ N. Longitude 52° 32′ west of Greenwich."[8]

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[8] Report of an Expedition into the Interior of British Guayana in 1835-6. Schomburgk. *Journal Royal Geographical Society*, 1836, p. 238.

"As already stated, a little before eight o'clock our column was put in marching order; Peterson at the head, carrying the British union flag, under which we had been marching for the last three years, through hitherto unknown parts of British Guayana. Now it was to lead us beyond the British boundaries into regions only known to the copper-coloured Indian; but we were animated with the hope of reaching for the first time, from this side of the continent, that point which in 1800 Baron Humboldt had, after so many difficulties, arrived at from the westward, namely, Esmeralda, on the Orinoco."[9]

"Of the expeditions more immediately under the control of the Society, that of Mr. Schomburgk, into British Guayana, has now nearly completed its fourth year, and the detailed report of his ascent of the Rivers Essequibo, Berbice, and Corentyn, has appeared in Vols. VI and VII of this Journal; during the two last seasons, which he has spent in the interior of the country, he has explored the source of the Essequibo, crossed the equator, and penetrated into 0° 12′ S. latitude; returning thence to Pirara, he crossed the Brazilian frontier to Fort San Joaquim, descended about thirty miles to Rio Branco, and explored the Carunia Mountains on the eastern bank."[10]

In conclusion it may not be inappropriate, as indicating the condition of the boundary controversy a half century ago, to quote the following from an analysis of Codazzi's map of Venezuela:

"The difference between the frontier claimed by the Venezuelan and that claimed by our own government, only affects the extent assigned by Codazzi to the Province of Guayana. When that controversy comes to be finally settled, the Venezuelan province of Guayana will in all probability be found to be of much less superficial extent than it is said to be in 'Resúmen.' A change in the statement of its area (and that is in a great measure conjectural) will, however, be all the alteration rendered necessary; for concerning that portion which may fall within the British frontier, the 'Resúmen' gives no information. The only satisfactory account of it is to be found in the Chevalier Schomburgk's Journal."[11]

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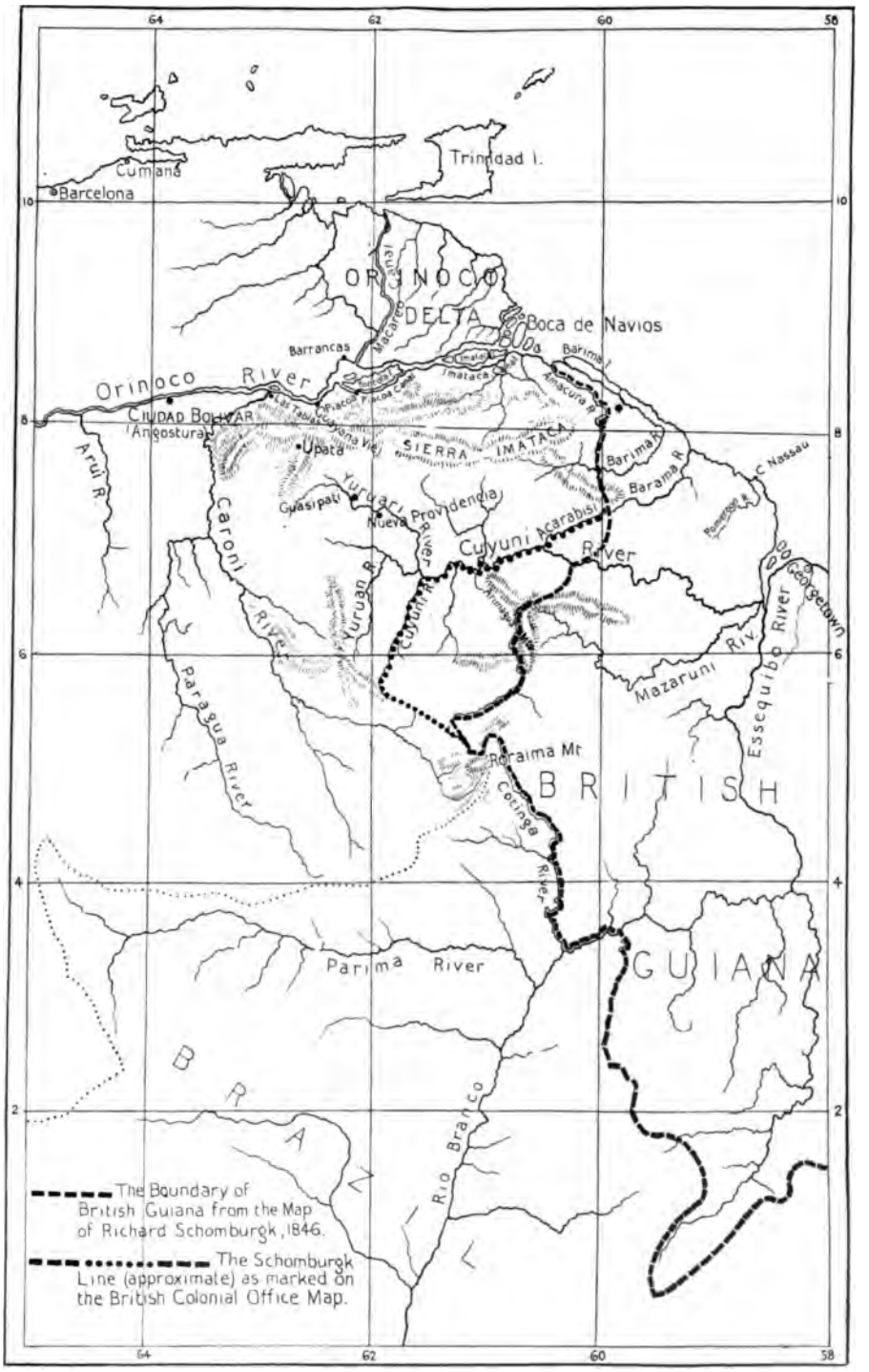
[9] Journey from Fort San Joaquim, on the Rio Branco, to Roraima and thence by the Rivers Parima and Merewari to Esmeralda on the Orinoco in 1838-9.
Journal Royal Geographical Society, 1841, p. 195.

[10] Report from the Council at the Annual General Meeting, May 27th, 1839, p. v.
Journal Royal Geographical Society, 1839.

[11] *Journal Royal Geographical Society*, 1843, p. 326.



THE GUIANA-VENEZUELA BOUNDARY.

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A TRIP TO MANIKA LAND*

BY

J. EDWARD FARNUM, A. B., F. R. G. S.

(*Read before the Geographical Club, February 5th, 1896.*)

South of the great Zambesi River, the next river of any importance on the southeast African coast, is the Pungue. This stream flows into the Indian Ocean, or more properly into the Mozambique Channel, at about 34° east longitude and 19° 30′ south latitude. There are two ways of reaching this point from Europe, one via the German East African S. S. Company through the Red Sea, the other from England around the Cape.

As you sail along the coast, the first intimation of approaching land is a distinct yellow line, where the waters from the Pungue River strike the Mozambique current. This indicates the entrance to the Pungue. Without this yellow coloring of the water, it would be almost impossible for the captains of the steamship lines to find the entrance to the harbor, as along the coast there are no landmarks visible, and the Portuguese have as yet put no mark to show the channel.

Beira is the seat of Government of the Mozambique Company

and is one of the most forlorn places it is possible to imagine; there are only two stone buildings in the whole town; all the rest are merely temporary structures made out of light lumber and corrugated sheet iron. The port of Beira is one of the best on the southeast coast, as it has twenty-five feet of water at all times, and is fairly well sheltered. Into this bay, and separated only by a narrow promontory, there flow two rivers: the Bosi from the west, the Pungue from the west-northwest. On exploring from Salisbury, F. C. Selous chose the Pungue as the route for the British South African Company's railroad.

The river Pungue at its mouth is about four miles wide, shallow excepting in the channel, and filled with shifting bars. The banks are not visible for more than ten miles from the mouth. Dense mangrove thickets grow right in the salt water, rearing their stems, barren of all green vegetation, except the small, flat, dense top. In these swamps, there is no life, either animal or vegetable, except the mangrove itself which makes them very dismal. As you ascend the river, you begin to see, here and there, small bits of open prairie, though most of the bank is covered with dense tropical forest. Of animal life, you see nothing, except a few hippopotami and crocodiles. On my first trip up the river, in a small forty-foot steamer, without cabin or any protection from the tropical sun, we ran aground on one of the numerous sand-bars, just opposite the big Bijimiti, and there lay for three days, admiring the crocodiles by day and listening to the roaring of the lions by night. This place is thirteen miles below Fontisvilla, the head of navigation, which is about sixty miles from the coast, by water, though only thirty-eight by land.

Fontisvilla is the starting-point of the railroad intended eventually to reach Salisbury, though only completed for 119 miles, about a third of the way. This railroad is put together in the cheapest manner imaginable—with the lightest of iron, and about half as many ties as there should be. The ballast is merely the ordinary sandy loam dug from the ditches, and is so liable to be either washed or blown away, that they have passed a law, prohibiting people from walking on the road-bed, because, as they explained to me, they were afraid that it would be kicked to pieces. Fontisvilla is nearly a repetition of Beira, except that it has no stone houses at all, but prides itself very much on a small tin church. This was opened during my first visit, with great honors, according to the opinions of

the exiles in this fever-stricken place; that is, that for three days, nobody in town, not even the priest, was sober.

Above Fontisvilla the river narrows, and a perceptible current is felt, the tide at the mouth rising about thirteen feet. The banks are open across the flats to the south as far as the eye can reach; but, on the north, about four miles back from the river, the Sherimgoma Hills rise to about two hundred feet. These are the only hills in this region, worthy of the name. They extend from the Pungue, almost without a break, to the Zambesi, on the north. They are densely covered with forest, and it is here that elephants and rhinoceroses roam, only a few miles from Englishmen anxious to kill them for their ivory and hides. But on account of the jealousy of the natives, it is impossible to procure guides acquainted with the various water-holes. About forty-five miles above Fontisvilla, the Pungue separates into two branches, the Pungue proper, and the Dingading, which is in fact one part of the Pungue, and flows around a large island, about thirty miles long by ten wide. The Dingading is the northern and larger branch; and, as we intended to make our trip to the northward, we followed it as far as the mouth of the Urema, which flows from the Sungue Lake.

Thus far we had traveled by canoes, dug out of exceedingly hard wood, some capable of carrying twenty-five loads of fifty pounds each, or about twelve hundred and fifty pounds, besides the four men that propel them by paddles or by long bamboo poles. It will be well to give a general description of this place, as it will answer for all the eastern side of the Urema River. The country is so perfectly flat that, to obtain any view of one's surroundings, it is necessary to climb either a tree or one of the curious ant-hills, so common in this country, and often as high as fifteen feet. Here and there, in this flat country, one finds slight depressions, which form, throughout most of the year, swamps. The soil is a sandy loam, black and exceedingly rich, and supporting, on the dry hills, dense tropical forests, composed of African mahogany, lignum vitæ and ebony; and, on the level flats, long grass, sometimes fifteen feet in height, and a few palm trees. There is also a wood that I have never seen elsewhere; when dead it is coal black and emits an odor like violets. There are not so many creepers as one pictures there should be in a tropical forest, the commonest one being that from which gutta-percha is procured. This gum is prepared by the natives of the region, and is sold to the Portuguese traders of Shupanga and

Fontisvilla in small lumps, the size of one's finger, not, as further north, in large balls, as big as a man's head.

This description holds good for all the country in general between the Bosi River, one hundred and fifty miles south of this place, and the Zambesi, on the north. The people vary ; those to the south of the Dingading having been conquered and paying tribute to Guguanna, are not nearly so brave as the natives of Sherimgoma ; they are of one general race, but of different tribes, hating each other, and nearly always quarrelling. The subjects of Guguanna are forced to have their ears pierced as a sign of their subjection, like the Chinese with their pig-tails. The natives of the northern part of Sherimgoma are of an entirely different stock, speaking another language, and dressing in a slightly modified costume. The men of the south wear a breech cloth between their legs, and always prefer this to be colored ; those of the north wear white cloth, tucked into a string around the waist like a petticoat, which resembles the dress of the women of all this country. This difference of nationality may be turned to advantage by a person traveling through the country, by getting bearers from two or three of these petty sub-divisions, thus preventing all his men deserting him at one time, as they will not depart together. The Zambesi boys are the hardest workers, but the most cowardly of all, so much so that it is not unusual to see them run away when one shoots a small antelope, weighing about a hundred pounds, that could not possibly harm them. They are useless, therefore, for gun bearers, but make splendid, willing, and faithful porters. The natives further south are better for hunting, but complain constantly about their work, even if it is but light.

The natives throughout this region manufacture two alcoholic drinks. The most popular is called Shema, made from the fermented juice of a palm, very similar to the cabbage-palm of Florida. The other is called Shoawalla and is prepared by boiling corn-meal and mixing with this thin gruel a small amount of malt. The mixture is then allowed to ferment for about three days. Its taste is sour, like the mash from which whiskey is distilled, but nevertheless it is very palatable on a hot day. This drink is exactly similar to the Makali of the Koreans, except that the latter is made from wheat-meal. The food of these people consists of corn-meal and the meal made from Caffir-corn, a species of sorghum, helped out with tomatoes, pumpkins, ochra, egg-plant and some sort of African

bean. The seeds of all these plants, except Caffir-corn, have been procured from Europeans at some distant time.

The people are evidently at present degenerate, as there is evidence of their having both owned cattle and raised rice. They have few or no traditions, even the ceremony of marriage having been given up. Nothing is done to celebrate this important occasion but to pay the father the price and, with the bride dressed in her best, start for the home of the groom, where a new hut has already been prepared for the dusky beauty. The only form of religious ceremony I ever saw or heard of in this country, was one in the early spring. On this occasion, in one of the villages an hereditary priest and priestess, if they might be so termed, poured a little Shoawalla on the ground of their garden, with various chants. This, as near as I could find, was to propitiate the Goddess, or God, of Fertility, a Deity evidently corresponding to Ceres of the Romans. This particular ceremony took place at Kia Sakura, whose inhabitants came originally from the Bosi River. They were not exactly the same tribe as the Sherimgomas, but spoke the same language, and were practically the same people. Whether this particular custom was prevalent among those dwelling on the Bosi, I am unable to state from personal observation, though they have some religious ceremony connected with their beer-drinking, which is not found among the Sherimgomas.

In this country, nobody is supposed to die a natural death; witchcraft is responsible for all. If a man's wife dies, he blames his father-in-law for depriving him of her, and sues him for the purchase-price, before some witch-doctor. The father brings a countersuit for the loss of a daughter, whom he has already sold. One of my men told me that he had such a suit, and, as he was richer than his father-in-law, he thought that he would win, as he could make the judge handsomer presents, and would therefore be entitled to get his money back, or another wife, although he had been married to the deceased for about thirty years.

At the mouth of the Urema, game is very plentiful. There are thousands of buffalo, water-buck, blue wilde beest, Burchell's zebra, reedbuck, and some of the smaller antelopes. All these animals are to be found in the bare swamp country. They are all animals of the open plain, rarely or never going into the forest; though buffalo are sometimes to be found along the edge of the forest-covered hills.

From the mouth of the Urema to Kia Sakura, the path leads

along the eastern bank of the Urema, through what must be, at certain seasons, an impassable swamp; though, at this time, we found only one morass. There are two dry rivers, which during the rainy season flow down from the Sherimgoma Hills. On one occasion, one of these rivers was a hundred yards wide by two feet deep, flowing at the rate of about seven miles an hour, after a rain of three days. It must be quite a large river during the rainy season; though never before have I known it to be possible, at this time of year, to get water, even by digging in the sand of the river-bottom. Kia Sakura is, roughly, about sixteen miles from the mouth of the Urema, and still in this same flat country.

From this place you obtain a view of the two great landmarks of this country—the Saluba Hills, three cone-shaped hills to the southwest, and the Gorongoza Mountain, to the northwest, each distant about fifty miles, the latter quite an imposing mass of rock, about 4,500 feet above the level of the sea. These are the only mountains, worthy of note, in the region. From here, the path leads about twelve miles due north to Makaia de Sena, the residence of Barata, a Portuguese ivory-trader, who married the daughter of the Chief of the Sherimgomas, and took the country away from its native rulers. The Sherimgomas had for years an hereditary Chieftainess—not Chief—the line being carried through a female, not, as is usual in savage tribes, through a male.

Makaia de Sena is about four miles to the south of the Sungue Swamp and Lake. Between these two places there flows the Chicongue, from a swamp in the hills, across the path into the Urema, about nine miles north of Kia Sakura. About five miles north of Barata's is an old kraal, deserted—the name unknown—situated on the Morezi River. From here the path still leads north, till it strikes the open swamp surrounding the Sungue Lake. This lake is about eleven miles long by four wide, though the swamp that extends around it is much larger. Here are the headwaters of the Urema River, to which streams come in from all directions. The next stream is the Moynza, about twenty miles beyond the Morezi. This is a fairly large river of clear, cool water, coming down from the Sherimgoma Hills, the first really good water to be had in this country. About ten miles further on is the town of Nagoya, on the Chuana River. Here the path leaves the Sungue to the southwest, and takes you up into the rolling country, covered with forests and open parks. It was here that we first saw the locust, the plague of Africa,

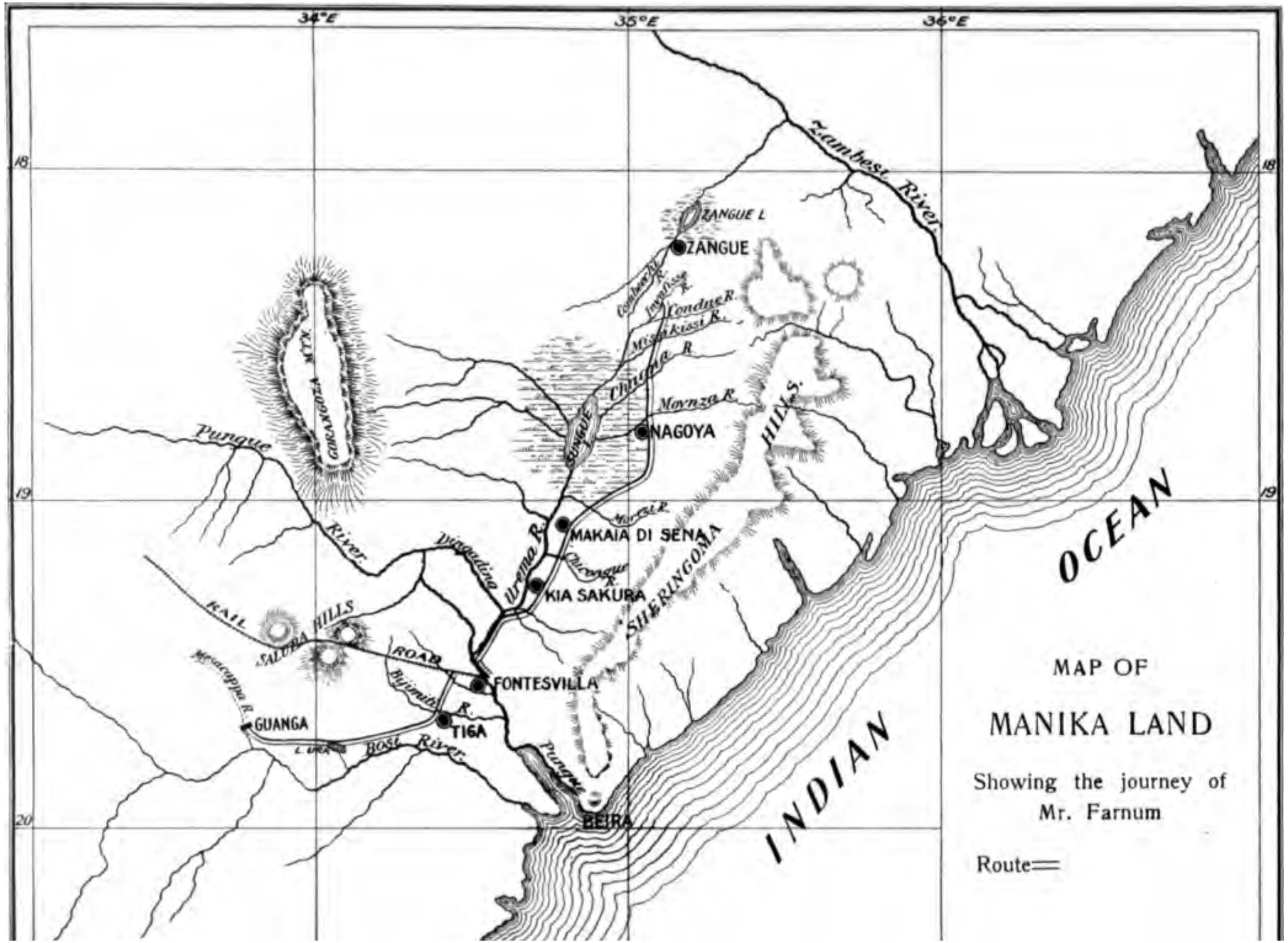
which, since the days of Moses, has been the fear and detestation of all the people of this land. This swarm is supposed to have come from Egypt, though another theory is that it came from the Kalahari Desert. The Egyptian theory seems the most likely one, as all along the eastern coast of Africa the vegetation had been eaten bare in 1894. About four miles beyond this, to the north, one reaches the Biwi kraal, on the Messikissi River, a small stream flowing into the Sungue from the hills to the east. About five miles further on the Condwe is met, dry at this season of the year and very small at any time. Three miles beyond the Condwe the path crosses a small running swamp, called Inyafisse. About five miles beyond this there is the Combeechi, another small stream. About five miles from the Combeechi one enters the Zangue Swamp. The drainage from this swamp, from all I could hear, flows both north and south, and empties partly through the Zambesi and partly through the Pungue, latitude about 18° 20′ south. At this point we were forced to return, because the natives would not sell us any provisions for our boys.

The country south of Fontisvilla is like that to the north, its traits even more marked. There are no hills, not even the characteristic ant-hills, so common north of the Pungue. The country, after one crosses the Bijimiti, or Mudashira, as it is named, at the headwaters, is a dry, flat desert. There is no water in the dry season till you strike Lake Ura, fifty miles to the southwest. This we did not know when I first crossed this plain, so I passed a very uncomfortable night—nothing to drink, after walking thirty miles under a tropical sun. Lake Ura is a small lake about three miles long by a mile wide. The water from it flows into the Bosi, not, as reported, into the Pungue. It is here that most of the canoes used in this region are built, as the forest is dense, composed of very large trees, some of them at least six feet in diameter. From the Ura to Guanga's kraal, situated on the Messacappa River, is about thirty miles. Guanga is one of the more important sub-chiefs of the recently deposed Gaza Zulu chief, Guguanna. It is Guanga's boast that he has never allowed a Portuguese in his town ; and I suppose this must be so, as the Portuguese have no record of him and know nothing about him. His village, or collection of villages, is situated in a dense forest, through which you have to pass, by secret paths, for thirty miles. The only drink to be had on this trip is the sap of a tree, taken from a hollow about thirty feet from the ground. He

who loses his path and misses this tree is almost certain to die of thirst. In this forest there are, I have been told, some rhinoceroses. I have seen the tracks myself of a good many elephants, and these are the only inhabitants, except the usual pests of tropical countries, snakes, scorpions, mosquitoes and flies. There are no snakes to be found in the swamp country, but in the forest they are very plentiful.

The climate of this low, alluvial flat is moist at all seasons, and, for six months of the year, there are almost continuous rains. The wind from the southeast, called by the natives "kutsi," is the rainy one. During the dry season, this wind is cold and disagreeable like our northeaster. The climate is hot, even in the winter-time, and, in the early spring, the thermometer often reaches 120° in the shade; and, as there is usually no shade on the march, traveling is very disagreeable, as it would not be safe to journey at night, owing to the number of lions. Fever is very prevalent and malignant throughout all this country. Even the natives are attacked by it in a mild form. It was a little north of where I turned back, that Mrs. Livingstone, the wife of the famous Doctor Livingstone, died of fever, on one of his trips up the Zambesi. Nora, the hereditary Chieftainess of the Sherimgomas, was converted and baptized by Doctor Livingstone. I have seen in that region long letters, written by the famous explorer to this convert, of whom he seemed very fond. She was not a full-blood negro, her father having been a Portuguese, like her husband.

The season of the year, in which I visited this country, was from August 1st to November 25th. After this time, it rains almost continuously for six months.



MAP OF

MANIKA LAND

Showing the journey of
Mr. Farnum

Route=

BULLETIN

OF THE

Geographical Society

OF PHILADELPHIA

VOL. II APRIL, 1898 NO. 3

A Proposed System of Drift Casks TO Determine the Direction of the Circumpolar Currents,

BY

COMMODORE GEO. W. MELVILLE,
Engineer-in-Chief, U. S. N.

The Board of Directors of the Society is pleased to announce that arrangements are being made to carry out the plan of drift casks as described in the following paper by Commodore Melville. It is hoped that efficient aid in the distribution of the casks will be furnished by the U. S. Revenue Cutter Service, and the co-operation of a number of captains engaged in the whale fisheries of the northern Pacific has been secured through the good offices of Prof. George Davidson and Messrs. Blum & Co., of San Francisco, Cal. To supplement and illustrate the communication, a circumpolar map, showing the probable track of the casks, is appended; and the paper read by Commodore Melville at the "Nansen" meeting of the American Philosophical Society on October 29, 1897, narrating the drift of the *Jeannette*, is reproduced with the sanction of that society.

In accordance with the invitation of the Geographical Society of Philadelphia, I have the honor to present herewith in extenso the plans of my proposed system of drift casks, intended to demonstrate the drift of the ice from the vicinity of the open

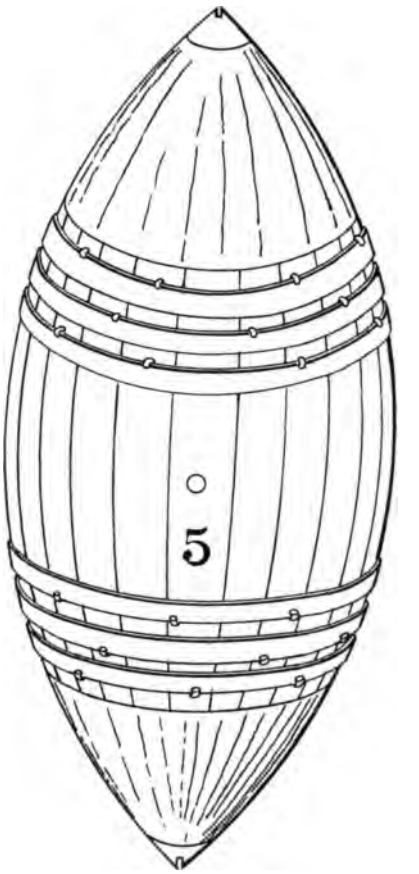
water usually found near latitude 70° N. and longitude 170° W. from Greenwich across the Polar Ocean to the north of Siberia, traversing the northern shores of Franz Josef Land, and Spitzbergen—possibly demonstrating the existence of a current far enough to the north and west to meet the polar drift which runs southward along the east coast of Greenland, turns Cape Farewell, and thence sweeps to the northward along the west coast of Greenland: whence it turns to the westward, thence to the southward, where, as part of the Labrador pack, it eventually finds its way into the Atlantic ocean.

It is at least a disputed question in my mind whether any genuine relics of the *Jeannette* were ever found on the west coast of Greenland. This uncertainty can be attributed to several causes: namely, that the newspaper accounts published at the time were full of errors or misstatements: that no favorable reply was vouchsafed to my repeated requests to have the so-called relics sent to me for identification—which might readily have been done at little or no cost: and that these relics have now entirely disappeared—a condition to be deplored and a circumstance at variance with preconceived ideas of the value of such articles had they fallen into the hands of the geographical societies of Europe, particularly those of Denmark, Norway or Sweden—countries that are so intently interested in Polar research.

Let it be understood that I believe that such a drift as the so-called *Jeannette* relics are said to have made is quite possible; but, the question in my mind is, why were not these relics identified when it could have been so easily done?

From the two accompanying drawings of proposed casks it can be readily seen that, although differing in construction, they are both adapted by strength of material and shape to withstand heavy pressures and to readily escape the grasp of the ice.

It will be observed that they have about the shape of parabolic spindles, or spindles of a revolution, of about twenty gallons capacity, made of heavy oak staves one and one-quarter (1¼) inches thick, firmly encircled with heavy iron hoops three-sixteenths (3-16) of an inch thick and two (2) inches wide. This great thickness is to allow for corrosion in a long drift of four or



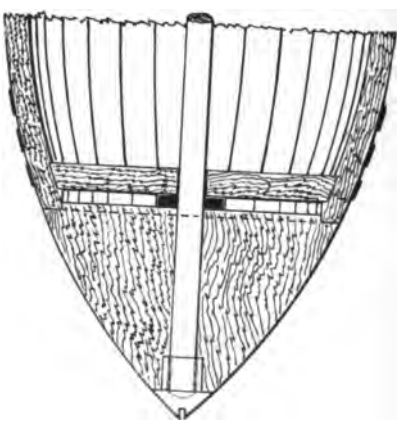
DRIFT CASKS

DESIGNED BY

Commodore Melville

TO SHOW THE

Arctic Drift



bean. The seeds of all these plants, except Caffir-corn, have been procured from Europeans at some distant time.

The people are evidently at present degenerate, as there is evidence of their having both owned cattle and raised rice. They have few or no traditions, even the ceremony of marriage having been given up. Nothing is done to celebrate this important occasion but to pay the father the price and, with the bride dressed in her best, start for the home of the groom, where a new hut has already been prepared for the dusky beauty. The only form of religious ceremony I ever saw or heard of in this country, was one in the early spring. On this occasion, in one of the villages an hereditary priest and priestess, if they might be so termed, poured a little Shoawalla on the ground of their garden, with various chants. This, as near as I could find, was to propitiate the Goddess, or God, of Fertility, a Deity evidently corresponding to Ceres of the Romans. This particular ceremony took place at Kia Sakura, whose inhabitants came originally from the Bosi River. They were not exactly the same tribe as the Sherimgomas, but spoke the same language, and were practically the same people. Whether this particular custom was prevalent among those dwelling on the Bosi, I am unable to state from personal observation, though they have some religious ceremony connected with their beer-drinking, which is not found among the Sherimgomas.

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At the mouth of the Urema, game is very plentiful. There are thousands of buffalo, water-buck, blue wilde beest, Burchell's zebra, reedbuck, and some of the smaller antelopes. All these animals are to be found in the bare swamp country. They are all animals of the open plain, rarely or never going into the forest; though buffalo are sometimes to be found along the edge of the forest-covered hills.

From the mouth of the Urema to Kia Sakura, the path leads

five years, in case the coating of "half stuff" (pitch and resin mixed) should be worn off by attrition in the ice. The conical ends are designed to avoid an end nip that might crush in the heads of an ordinary cask.

It will be observed that cask No. 1 is made after the ordinary manner, with solid wooden ends fitted to bear on the ends of the staves (not on the heads), held in place by a brass rod, with conical brass nuts to hold the cone ends in place—the rods and nuts being made of brass to avoid corrosion, and the diameter of the rod being 5/8 inch. It will also be observed that the cone ends are shouldered to fit inside the chime ends of the staves to avoid slipping, and that an elastic india-rubber washer is compressed between the cone and the head of the cask, and compressed around the brass rod, to make it water tight where the rod passes through the head. The rubber grommet is indicated in the sectional drawing in heavy black. The hoops are to be held in place from slipping by hook clips screwed into the cask.

Cask No. 2 is of similar oak stave construction, with this difference, that the staves are of one piece from end to end, so tapered as to form the spindle, hooped in the same manner as No. 1, but capped on the ends with light cast brass caps to secure the ends and keep them water tight. As above stated, the casks should be painted with a heavy coating of black half stuff, to preserve them from corrosion and decay, and to help keep them water tight—black that they may readily be seen. They should be placed, if possible, on the heavy floe pieces, that they may drift with the ice. Being black, under the action of the summer sun they will sink down into the body of the ice and be preserved from harm by possible crushing. If thrown into the open water, they are apt to be drifted with the winds. The deep ice, being affected by under currents, will probably carry the casks on a more correct drift. The customary bung-hole and bung are fitted, the intention being to place within each cask a bottle, tightly corked, to preserve—in case the cask should leak—such records as the Society may see proper to place therein. I would suggest that a number of records be placed in each bottle, printed in the languages of the principal seafaring

nations, requesting the finder of the cask to preserve it and send the records to the Hydrographic Office of the nationality of the finder, such office, in turn, to send to the other nationalities the other records found within the cask, stating the latitude and longitude where found. A money prize might be offered to induce the finder to comply with the request, or to defray the expense of forwarding the cask or records. It would be well in all cases to request that the cask be preserved intact.

The casks being properly prepared—and numbered from one to one hundred, if the Society can afford that number—I would recommend that they be carried on a government vessel through Bering Strait, and set adrift in sets of five, numbered consecutively; commencing with the first five, at or near Herald Island, then proceeding to the northward, along the eastern edge of the ice pack, until the highest safe latitude is obtained—say latitude 75° N., longitude 170° W. from Greenwich. I suggest this latitude and longitude, because the polar pack in the above latitude commences to crowd well over to the eastward and toward the North American Archipelago, where other currents are known to exist. At this point final sets of casks are to be set adrift, to demonstrate if possible the currents to the eastward or northward and eastward, if any there prevail. If one hundred casks cannot be supplied, send fifty. The smaller number will only lessen the probability of the finds. There is no doubt but that they will come out somewhere. Siberian drift wood has been found on the northeastern shores of Bennett Island, on the northeast point of Nova Zembla, on the eastern coast of Franz Josef land, on the eastern shores of Spitzbergen and, possibly, in the drift of the eastern side of Greenland. A strong current is known to exist at certain seasons of the year to the southward and westward, between the northern end of Nova Zembla and the southern side of Franz Josef land, and between the southern side of Spitzbergen and Bear Island—dropping the stones from the polar pack which form the shoal of 300 fathoms between the above islands.

We may look for the casks on any of the above shores or in the above-mentioned drifts, and also for the possibility of demonstrating a drift to the eastward or to the northward and

eastward, finally coming out by way of Smith's Sound and Kennedy Channel and Baffin's Bay, as well as by the slow drift through the North American Archipelago to the coast of Labrador.

In case the casks are entrusted to whalemen, due discrimination must be exercised in the selection of these men; as many whaling captains are not disposed to risk their ships nor to devote their time to anything pertaining to scientific research, though it is an undeniable fact that much valuable information is gained and given to the world by these enterprising rovers of the northern seas.

If a government vessel cannot be obtained, then a representative of the Geographical Society might accompany a whaleman, and direct—as nearly as possible—where the casks should be set afloat (or, if inexpedient, that none be set afloat); for, if they are not deposited in the proper places, and an exact record made of latitude, longitude, number of casks, etc., there would be but little use in setting them adrift at all.

I would respectfully suggest that the Society apply to the Honorable Secretary of the Navy, and request the aid of the U. S. Naval Hydrographic Office in this undertaking. Also that application be made to the Secretary of the Treasury, who controls the U. S. Revenue Cutter Service, and who sends one or more of their cutters into the Arctic Ocean yearly to look after the welfare of our whalemen. These vessels generally go too far to the eastward toward Point Barrow to fill all the requirements of the experiment; but they could with safety make the necessary detour to the northward and westward, along the eastern edge of the great Northern pack.

THE DRIFT OF THE JEANNETTE,

BY

COMMODORE GEO. W. MELVILLE,

Engineer-In-Chief, U. S. N.

Republished, by permission, from Proceedings of the American Philosophical Society, Philadelphia, Vol. xxxvi, No. 156.

It is with a great deal of diffidence that I arise to speak at all in discussion of so clever a discourse as that of Dr. Nansen, much less to criticise it, for my experience in three different Arctic voyages, in different Arctic seas, has taught me that only those who are in the same field at about the same period can have the requisite information to undertake a critical discussion. Moreover, Dr. Nansen's experience with respect to ice conditions, its formation, drift and other phenomena, so fully agrees with my own in the *Jeannette*, that there is no room for argument.

However, my sojourn of twenty-two months in a drifting pack of no mean proportions, extending from the Pole south to 70°, emboldens me to speak of some experiences, second only to those of Dr. Nansen and of Weyprecht and Payer of the Tegethoff expedition of 1871 to 1874.

The *Jeannette*, Capt. De Long, U. S. N., was boldly pushed into the ice in latitude 71° 35′ N., 175° W., as we then believed the theory of Dr. Petermann, the celebrated German geographer, that Wrangel Island might be of continental proportions, extending to the northward and eastward toward the Pole, and possibly extending so far to the eastward as to overlap the northern part of Greenland. It was thought to be what some explorers had supposed to be land seen to the northward of Spitzbergen, and extending as far to the eastward as the archipelago formed by Spitzbergen on the west and Franz Josef Land on the east.

It took us but a few days to prove that Wrangel Land was only an insignificant island, as we drifted across its northern face,

at times in as little as thirteen fathoms of water; and at times as close as fifteen or twenty miles to its northern shores.

It is needless to state that drifting in a heaving pack in so shallow a sea was most hazardous, the underrunning and overrunning of the floes causing them to telescope and rise to heights at times approaching 100 feet.

After our ship was solidly frozen in, she was never again released until she was finally crushed on June 12, 1881, after we had drifted twenty-two months in a zigzag course, many times lapping and crossing and recrossing our track. The resultant of our drift was north, 45° west true, distance 1300 miles, when our floe broke up, and the ship was crushed, in latitude 77° 15′ N., 155° E., leaving us 500 miles in a bee line from the nearest point of succor, the mouth of the Lena river, Siberia. We were left on the ice, thirty-three officers and men, with seven on the sick list, and with the disheartening prospect of hauling our baggage an indefinite distance to clear water. It consisted of eight pieces, giving each man fit for duty a load of 290 pounds to haul.

Just here, let me call attention to the very important fact that the *Jeannette* expedition is the first on record where such a long imprisonment in the Arctic pack was not accompanied by scurvy. The Lady Franklin Bay expedition, under the command of Lieut. (now General) A. W. Greeley, U. S. A., was the second up to the date of our wreck which had escaped the dread scourge. Our good fortune, so different from the experience of previous expeditions, can be clearly traced to good food, distilled water, good sanitary conditions, a light, though healthy diet, and abundant outdoor exercise, not of a laborious or wearying nature, every day in the year.

You will, I am sure, pardon me for introducing a few facts of the drift of the *Jeannette*, as leading up to the drift of the *Fram*, for Dr. Nansen put his ship into the ice to commence his drift about where the *Jeannette* let go, though a little farther to the westward. In other words, the *Fram* finished the drift that was commenced and prosecuted by the *Jeannette* involuntarily, for our intent was to go to the northward and eastward. But, after being beset in the pack, and drifting across the north face of

Wrangel Land, we were pretty sure that there was no possible retracing of our course, unless, by a swirl or turn of the floe, we might be cast out on the coast of Siberia, as the whaleship *Mount Wolloston* and others had been, which were visited by the native Tschuckchees and found abandoned.

As the cartographer of our expedition, I was directed to make a circumpolar chart showing every known current that had been laid down by Arctic explorers, from the time of Barents and Willoughby to date. We were fortunate in having a very extensive Arctic library on board, and, as the discussion of Arctic literature and the formulation of theories and conjectures were among our pleasantest ways of passing time, you can well imagine that, with eight intelligent readers in our cabin mess, it was not long before I had a chart with hundreds of arrows denoting currents as laid down by voyagers for more than 300 years. It was remarkable how plainly they pointed to the fact that, if our ship should hold together and our provisions last, we should drift out either by way of Franz Josef Land and Nova Zembla, or, taking the northern cant across the north face of Franz Josef Land, between Spitzbergen and east coast of Greenland. That was as well understood and believed by the officers of our ship as it is to-day proved by Dr. Nansen.

In addition to what we learned from our drift chart, we also knew that drift wood covered the east side of Spitzbergen, Franz Joseph Land, and even the northeast coast of Nova Zembla, where grand old Barents wintered, and it was certain that this was brought by the great Siberian rivers discharging into the Arctic ocean. These facts had all been established before our time, but none of us then supposed for a moment, nor do I now believe, that this debris would drift across the North Pole. In fact, I have not believed hitherto that it ever drifted beyond 85°, but Dr. Nansen and the drift of the *Fram* have demonstrated that it has drifted north of 86°. So I must concede that latitude, at least, as possible for drift wood to reach.

There were, however, two great "ifs" in the way of our accomplishing this long drift: Could our ship hold together; would our provisions hold out? We had pumped our ship night and day for twenty-two months, at first by hand and

steam power, afterward by a wind-mill that was extemporized on board ship, supplemented by hand power, or steam, as the emergency arose. The merry "chug" of the pump night and day, for twenty-two months, never ceased. Our game in the far north had become scarce, and we had not added much to our larder beyond a few seals, walrus and bears we had taken in the early part of our drift, in the spring of 1880.

After many consultations about the situation by the officers of the ship, and a close account of the provision list, it became manifest that our provisions would be exhausted before January, 1882. So, the question was whether we should abandon our ship in the spring of 1881, or the fall of the same year. As seamen, loyal to our ship and duty, we decided to remain by the ship as long as possible, though sober judgment taught us that the proper time to abandon the ship was in the spring, which would give us mild weather and summer game to assist us on our retreat. At that time, we were nearly due north of the New Siberian Islands, which seemed like stepping stones toward the Lena river and the coast of Siberia.

The problem was solved for us by the breaking up of the floe, which, in time, crushed our ship; and amidst the crashing and grinding of the poor old ribs of our good ship, we were cast out, Cæsar-like, from the bowels of our good mother *Jeannette*, who had sheltered us and kept us warm all these months.

At this very time we were making our most rapid drift to the northward and westward, and it was impressed upon us in a most startling and disheartening way. The *Jeannette* was crushed and sank in latitude 77 15′ N., longitude 155° E.; after marching southward twenty-one days, we found ourselves in latitude 77° 36′ N., longitude 153° E., or actually *twenty-eight miles northwest of where we had started* and at the most northerly point of our voyage. This rapid drift is the key to the situation pointed out to our good friend, Dr. Nansen, who had the sagacity to seize the idea and to originate the theory that has led to his great success.

As I have said, our retreat lay directly south, about five hundred miles in a straight line. At the start we had sixty days' provisions, allowing one and a half pounds per man per day.

Most of our dogs had died during the first winter, and of the remainder we shot all but eleven good ones, which, however, rendered very little service, eating nearly as much as a man and doing about one-tenth as much work, so that we finally shot them also.

Thus we journeyed, dragging our boats and provisions on sledges over the broken floe, and finally taking to the boats to cross the open sea to the Siberian coast. It was the stormy fall season of gales, ice and snow. Our small open boats were often in danger of foundering, and in the fiercest of the gales Lieut. Chipp's boat was swamped, drowning him and his seven men.

The other two boats, those of Captain De Long and myself, succeeded in reaching land, although one hundred and fifty miles apart, thus ending our long retreat of one hundred and ten days. De Long and all but two of his men perished of cold and starvation. My crew of eleven all told were more fortunate, all being saved, although one died of smallpox in Siberia on the way home. The total loss was thus sixty-six per cent. of the personnel of the expedition, and of the original survivors there are only six now alive.

Now, as regards our drift. It was quite evident that, for the first eighteen months at least, our drift was caused by the fierce southeasterly gales that drove the pack up into the northwest. We can conceive the effect of the innumerable hummocks of ice, like millions of sails set to catch the breeze. After the subsidence of each gale, we took a rapid setback drift to the southeast. In fact, in the spring of 1880, after our first winter in the pack, we were driven back in sight of Wrangel Land to about the place where we were first beset, which accords with Dr. Nansen's experience.

Dr. Nansen found a deep sea to the northward and westward of the line of our drift, which is the exact opposite of our experience in the part of the ocean we traversed. Although soundings were taken every day at noon, they never but once showed more than from thirteen to thirty-six fathoms. Even this greatest depth was only eighty fathoms, which occurred at the most northern point of our drift during the winter of 1880.

I had a theory of an ice cap at the Pole (which, by the way,

our good friend, Dr. Nansen, has very materially shaken) extending down to about 85°, against which I believed the drifting pack impinged. Between this supposed ice cap and the drifting pack, in the shallow sea in which we were drifting, I conceived a canal of comparatively deep water, which my messmates in derision called "Melville's Canal." It is needless to say, however, that I was pleased, as were also my messmates, to find that we were on the edge of "Melville's Canal" when we got a cast of the lead in eighty fathoms of water, and they conceded that my theory of a deep canal might be correct, so that, in our theories at least, "Melville's Canal" had a recognized standing.

Unfortunately, after the southeasterly gales had ceased to blow, we were rapidly drifted back again by the receding ice, and never again got far enough north to find the deep water where currents alone can run. It is impossible for any geographer to conceive of a natural sea current in a shallow sea of thirty fathoms. Local currents, it is true, may be caused by wind or tide, if there is any; or by the outflow of great rivers; but a natural current of inlet and outlet, caused by the heated or chilled waters, such as the mighty Gulf Stream, or the Kuro Siwo of Japan, can only run and be maintained in water whose depth is measured in hundreds of fathoms. Such seas we did not find. Hence, my theory of wind currents in a shallow sea. Another fact of our drift is that our floe was continually swinging around, not always in the same direction, as our ship's head pointed to every point of the compass, though frozen solidly into the moving pack, demonstrating the fact that the great floe itself was in a "swirl." Dr. Nansen was more fortunate in early striking "Melville's Canal," where the water was deep enough to permit ocean currents to run.

Now, as regards the shallow sea over which the *Jeannette* drifted: Is this shallow sea caused entirely by the silt of the great northern rivers, or is it partly caused by the erosion of the land? The islands that extend all the way from the Lena Delta to "Bennett," "Jeannette" and "Henrietta," like so many stepping stones from the mainland toward the Pole, were, in my belief, at no very distant period, part of the mainland of Siberia. They are daily being eroded by the drifting ice pack;

and, in time, nothing but the bare rocks will remain of these islands.

During our short stay on these islands, while on our march to the south, and while we were in the Lena Delta, the land was not making, but the daily evidence of the constant washing away by sea and ice floe, or melting snow, and occasional rain, showed that the islands were being denuded and eroded away.

I saw, on the banks of the Lena Delta, immense trunks of trees, with roots attached, that had apparently fallen *in situ.* Forty feet above the bed of the river, these lands were gradually washing away. These lands and the islands of the Arctic sea still show the remains of the mammoth which, without doubt, was a native of the mainland, and of the islands when they were part of the mainland. We found remains—tusks and teeth of the mammoth—as far north as Bennett Island, and, I doubt not, had time sufficed, similar remains would have been found on the other islands visited by the *Jeannette.*

I have thus digressed, gentlemen, from the main question of Dr. Nansen's drift, in order to justify the theory of a shallow sea more than 1500 miles in extent, east and west, though perhaps local in its northerly extension.

And now that Dr. Nansen has made the most magnificent drift on record, attained the highest latitude known to man, and made the most fortunate and masterly retreat, let us say, "Well done, Nansen!" and let us plan the next possible drift from the east toward the west to make a high northern latitude, reaching, if possible, within marching distance of the Pole.

If Dr. Nansen is correct in his conjecture that we have deep water and broken ice, with open "polynias" all the way to the Pole, and, if my theory of a solid ice cap at the Pole (like an inverted saucer) is wrong, let us theorize a little further, and seek the best place to put a ship in the pack for such a drift as is contemplated. Let us see where our ship, if she holds together (which is doubtful), or if not crushed (possibly being buried in the overlapping and underrunning floes), let us conjecture, I say, the best place to put the ship in the pack for such a drift.

Dr. Nansen took several months to proceed from Norway, along the coast of Siberia, toward the river Alaneck, before he

pushed north to take up the drift about where the *Jeannette* let go and sank in thirty-four fathoms of water; thus losing valuable time after leaving any source of supplies.

We must get north as rapidly as possible after leaving our last depot of provisions, so that if Dr. Nansen's theory of the Arctic ocean currents and of the ice conditions toward the Pole be correct, I believe that the proper place to put a ship in the ice will be through Bering strait. We should keep along the east edge of the pack in about longitude 165° W., attaining the highest possible latitude, and westerly longitude, culminating together. Then we should push the ship into the pack as far as possible to the northward and westward, and await the fulfillment of the prophecy of one of the jolly whalemen I met at San Francisco. He said: "Melville, push her into the ice at about the point I have mentioned, and you will either go to the Pole or to hell, and I believe the chances are about even." I can't agree with my whale-fisher friend about the hell part of the business, for true philosophers have a right to disagree about that. I do believe, however, from the information we have gained from the drift of the *Jeannette* and of the *Fram*, that vessels of any kind, such as casks or driftwood, will come out by way of Spitzbergen—though not necessarily across the Pole. The only reason for sending men in ships is that they may be observers to make a daily record of events, and of phenomena, such as latitude, longitude, soundings, daily drift, dredging the ocean's bottom if possible; in fact, recording all the phenomena proper on such an expedition. But for this, I say, a hundred oaken casks, properly numbered, made after the manner of a beer keg of twenty gallons capacity, properly hooped, and the ends extended out to complete a parabolic spindle, would demonstrate the drift. At the end of four or five years, we might begin to look for the beer kegs between Spitzbergen and Greenland. And now, as regards the work of our honored guest this afternoon:

His is the honor to have reached the "Farthest North," the *Ultima Thule*, that has defied the best blood and brains for three centuries. He it was who conceived the grand thought of making that most perilous drift, though he knew not how long it

might last, nor whether his good ship and ship's company would ever drift out of the terrible unknown sea of ice and snow. His was the honor—after waiting months and years for the slow drift, and becoming impatient of the gods of ice and snow—to break away from the good ship in order to add a few more miles to his northern journey; and, taking his life in his hands, with but one solitary human companion, to make the long and dreary march to Franz Josef Land. And to what purpose? That we, the eager, driving, working world, might have that knowledge which is power, wealth and happiness.

And let me ask my hearers this afternoon, What better school of heroic endeavor for our lusty youth than the Arctic ocean? There, amidst the silence of the eternal ice and snow, man can commune with the God of Nature in the hushed stillness that brings awe, but not fear, to the soul of the intrepid explorer, and there he receives the inspiration that spurs him onward in his search for the great unknown!

This, gentlemen, is Dr. Nansen, the guest whom we delight to honor, who among Arctic explorers is "the noblest Roman of them all."

THE NORTH AMERICAN CONTINENT.

From a Photograph of the Butler Relief Model.

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The Names of the Larger Geographical Features of North America.

BY

ISRAEL C. RUSSELL.

From the manner in which a knowledge of the geography of North America has grown, it is but natural that the names applied from time to time to the larger features of the continent should be inconsistent among themselves and lacking in definiteness. The time seems to have come, however, when an adjustment in this connection can be made, which will simplify geographical study and facilitate investigation. Attention is here invited to this matter with the hope that a discussion concerning it may be elicited and perhaps a consensus of opinion reached.

North America, as is well known, consists mainly of three great natural divisions : a mountainous region on the east, a central basin consisting of plains and plateaus and a mountainous region on the west. By what names shall these three major divisions of the continent be designated?

The generic terms, as they may be considered, that have been used by geologists and geographers for topographic forms, adopted for the most part from common usage, have until recently been loosely applied, and even yet cannot be said to be strictly defined. To be sure, topographic forms are seldom separable into definite

groups bounded by hard and fast lines, but this is true throughout the realm of nature, and it is to be understood that even the best classification of plants, animals, geological terranes, topographic forms, etc., must be more or less artificial.

The central basin of North America, open to the sea both to the north and south, and sometimes termed the interior continental basin, may with propriety be named the North American basin. This name seems sufficiently definite for present needs, although the generic term *basin*, has no special meaning. Before discussing the names of the mountains bordering the continental-basin certain preliminary considerations are necessary.

Mountains have been arranged under various group-names, but a generally accepted nomenclature is lacking. The best statement of the classification of mountains that has been made is probably that presented by J. D. Dana,[1] which is followed in a general way below. Beginning with the smallest and simplest forms and proceeding to the more complex, we have *peaks* and *domes*, *ridges*, *ranges*, *systems*, *chains* and *cordilleras*.

Peaks and *domes* are individual mountains or mountain summits, produced in the majority of instances by erosion, but in many cases due to volcanic eruptions, as is illustrated by Mt. Rainier, Mt. Shasta, etc., or to intrusions of igneous matter into the earth's crust from deep below the surface so as to raise domes over plutonic plugs, laccoliths, etc.; similar topographic forms may originate from the upheaval of the corner, so to speak, of a tilted block of the earth's crust, as is instanced by Mt. St. Elias.

Ridges may be considered as elongated peaks, and are due in the majority of instances, to erosion which has excavated the bordering valleys, but many examples might be cited which have been produced by the upheaval and tilting of fault-blocks as is common in the Great Basin region, or to the formation of upward folds in the earth's crust.

Ranges consist of groups of peaks, domes and ridges produced by a single series of movements in the earth's crust, or by a series of movements affecting the same region, as in the case of the Sierra Nevada, Wasatch, Uintah and Appalachian mountains, or by a series of more or less continuous volcanic eruptions along a single belt, as is illustrated by the Mono craters, California. The

1. Manual of Geology, Fourth Edition, 1895, pp. 24-28, 389-391.

primitive form of a range may be and usually is, greatly modified by the weathering of the rocks and by erosion.

Systems, as defined by Dana, comprise two or more mountain ranges of approximately the same period of origin, belonging to a common region of elevation, and generally either parallel or in concentric lines or curves ; and again (ibid., page 389), "mountain systems include all ranges in a region made in different, more or less independent, geosynclines at the same epoch. (By geosyncline is meant a downward bending of the earth's crust of great extent and breadth, accompanied usually by minor or secondary foldings.) For example, the Appalachian range was formed at the close of the Carboniferous period, as were also certain uplifts in Nova Scotia and Newfoundland. These two ranges formed at about the same time would be placed in a single mountain system. In this same region, however, occur the Adirondacks, the Green mountains and the White mountains, each of which is of older date than the Appalachians, and apparently belongs to two distinct systems. Thus two or more systems may exist in the same general region.

A Mountain Chain is a combination of associated mountain systems. Along the Atlantic border of the continent, still following Dana, there is the Appalachian system of post-Carboniferous age, the Taconic system of middle Silurian (post-Ordovician) age, an Archean system represented by the Adirondacks, the Palisades of the Hudson of Jura-Trias age, and still others less well defined. These several systems form what may be termed the Appalachian chain—naming the chain after the most important or best known of its component systems. In like manner, the Rocky mountain chain includes a large number of systems, extending from southern Mexico northward to northern Canada. The Sierra chain comprises the Sierra Nevada system, the Cascade system and the Coast system of British Columbia (the Coast range of Dawson). Similarly the Coast mountain chain extends along the immediate coast of the Pacific from Southern California to Mt. St. Elias and beyond ; future discoveries will probably show that this long belt of mountains should be divided into two or more chains.

Cordilleras : Still larger groups of mountains, consisting of two or more chains, may with consistency be termed a cordillera. Such a group or association of mountain chains exists on the eastern and another and larger group on the west border of North America. These two cordilleras embrace all the mountains on the continent,

with the exception of the isolated Ozark uplift and the Black Hills of Dakota; although the former is considered by certain geologists as belonging with the Appalachian chain, and the latter is still more definitely an outlying range of the Rocky mountain system.

While *range*, *system*, *chain* and *cordillera* need to be defined, it is not to be expected, at least for a long time to come, that this scheme of geographical nomenclature or any other technical plan will be adopted in popular writing and in every-day usage, and general terms which do not imply geological age, structure, etc., are necessary. For non-technical usage the term *mountain* remains, with its common and somewhat indefinite meaning, of a single prominent elevation on a rugged region; mountain group, mountain belt, mountain series, are convenient general terms, referring simply to external form without implying a knowledge of age or structure.

Under each of the generic terms used by Dana, are included volcanic mountains, mountains produced by folding, faulting, etc.; when desired, such features of the history of a mountain system, chain, etc., can be introduced, as can also references to the nature of the rocks, whether sedimentary, metamorphic, etc.

In the study of the physical geography of North America I find it convenient to name the two great cordilleras referred to above after the oceans with which they are respectively associated. On the east border of the continent we have the *Atlantic Cordillera*, or less technically the *Atlantic mountains;* and on the west border the *Pacific Cordillera* or, for popular use, the *Pacific mountains*.

The adoption of the name Atlantic Cordillera does not appear to violate any precedent and supplies a want which must have been felt by every one who has attempted a systematic study of the physiography of North America.

In suggesting the adoption of the term Pacific Cordillera, and the less technical appellation Pacific mountains, we are met by the claims of primity in more than one direction. The great mountain belt referred to has been frequently designated, in an indefinite manner, as the Rocky mountains, but this name is used much more generally to designate the eastern system of the region referred to, but even this custom is not adopted by all geographers who have studied the western portion of the continent; J. W. Powell, for instance,[2] uses the name Stony mountains and Park mountains, for

2. National Geographic Monographs (published by the American Book Company under the auspices of the National Geographic Society), Vol. I, 1895, p. 96 and map.

the two divisions of the system referred to, within the borders of the United States.

Again, the Pacific Cordillera, as defined above, has been termed the Cordilleras by several scientific writers, notably J. D. Whitney and Clarence King, but the term has never been generally used and is practically unknown among the people living in the region referred to. The term Cordillera standing by itself is seemingly inappropriate, since there is another although smaller belt of mountains in North America, which demands equal classificatory rank. An adjustment of these conflicting usages can be had by terming the "Rocky mountains" (in the broadest sense in which the name is used), or the "Cordilleras," the Pacific Cordillera, in scientific treatises, and the Pacific mountains in popular writings and in elementary geographies. Here, however, another conflict with precedents arises. The term "Pacific mountains" was proposed a few years since by Powell, in the book just referred to, for the mountains on the Pacific border of the United States, including the Sierra Nevada and Cascades and the several Coast ranges. Without wishing to infringe on another person's patent, I believe it would be a great advantage to students of geography if the name referred to could be used for a larger group of uplifts, in the manner suggested above.

The larger geographical features of North America under the nomenclature here considered are: 1st, the Atlantic mountains (Atlantic Cordillera), embracing all of the region adjacent to the Atlantic coast having a mountainous structure, from the central portion of Alabama and Georgia northward to the Arctic ocean; 2d, the North American basin, bounded on the east by the Atlantic mountains and on the west by the Pacific mountains; 3d, the Pacific mountains (Pacific Cordillera), beginning at the south in south central Mexico and extending northward across the United States and Canada to the Arctic ocean;—in Alaska, a branch of this series of mountain chains extends westward along the border of the Pacific ocean and forms the Aleutian islands.

In its more popular form the nomenclature for the larger geographical features of North America here suggested would, it seems to the writer, be an advantage in elementary geographical studies, while its more technical phase would stimulate and direct physiographical research.

In order to obtain the opinions and criticisms of others better qualified than myself to judge of the value of the plan proposed

above, copies of this essay were sent to a few geographers and geologists, with an invitation to contribute to the discussion. The replies received are here appended:

GEOLOGICAL SURVEY OF CANADA,
GEORGE M. DAWSON, C.M.G., LL.D., F.R.S.,
Deputy Head and Director,
Museum and Offices, Sussex Street, Ottawa.

April 1st, 1899.

DEAR PROF. RUSSELL:

I am in receipt of your letter of March 21st, with the accompanying MS., on *The Names of the Larger Geographical Features of North America*, both of which have been carefully considered.

The main proposition is the employment of the terms Atlantic Cordillera and Pacific Cordillera, and the use of these in a definite scheme of mountain nomenclature. This suggestion does not recommend itself to me. The name Cordillera, as first applied, I believe, by Whitney to the whole belt of Pacific Mountains, has been very generally accepted; it is convenient, and denotes a particular great mountain system having many peculiar characters. If it is necessary to have a popular name as well, we have "Rocky Mountain region" or "Rocky Mountain belt," which no one confounds with "Rocky Mountain range" or "Rocky Mountains proper." The Appalachian system is already well known under that name, and is, I think, entitled on all grounds to retain it. It possesses, moreover, the advantage of *excluding* the mountainous Atlantic border of Labrador, which is something wholly different.

If an entirely general name is required for the Western and Eastern mountain systems of North America, why not refer to them as such, or as the Western and Eastern Alps? There is, I think, a danger, particularly from an educational point of view, in formulating any too precise and carefully subordinated system of verbal classification for such natural features. The student should not approach nature from that side, for if he does so, in most cases he will acquire little more than a mastery of the nomenclature for purposes of examination.

Among other points which occur to me in reading your MS., are the following:

The Laurentian plateau or "shield" should, I think, have its place as a *fourth* great natural division of the Continent, of equal rank with the three you enumerate.

The interior continental *plain* is, it seems to me, more appropriate than the use of the word *basin*, which as you say has no special meaning.

The Sierra chain and the Coast Mountain chain, as defined, appear to me to consist in each case of several heterogeneous elements—so much so that to unite these for any purpose under specific names is inappropriate. The Coast mountain chain, for instance, consists of at least three parts, with scarcely anything in common but the fact that they border the Pacific Ocean.

You will observe that I have taken full advantage of your invitation to criticise the scheme advanced, feeling that this would be in accordance with your wishes, and you are of course quite at liberty to publish this letter with others on the subject if you should wish to do so.

Yours truly,

GEORGE M. DAWSON.

Prof. I. C. Russell,
Ann Arbor,
Michigan, U. S. A.

SMITHSONIAN INSTITUTION,
BUREAU OF AMERICAN ETHNOLOGY,

WASHINGTON, April 12, 1899.

MY DEAR RUSSELL:

I have at last found time to give consideration to the question propounded by you on March 21st.

I think it desirable to designate the mountain region of the east in North America as something distinct from the valley region, which extends from the Gulf to the Arctic Sea, and then have a distinctive name for the mountains on the west. This will conduce to simplicity of description and be true to the grand facts.

I should include the Ozarks with the eastern mountains. I should call the eastern mountains the Atlantic mountains, composed of the Appalachian system and the Ozark system. I should call the western mountains the Pacific mountains, which should include the

Coast ranges, the Sierra Nevada system, the Cascade system and another to be defined hereafter to the north, together with the Stony mountain system, the Park mountain system, the Wasatch system and the Desert mountain system. The Stony mountains and the Desert mountains are two well-defined systems geographically, and ought to have distinct names. The Rocky mountains is a general term used indefinitely to include the Park mountains and the Stony mountains and some other. It might be well to call all of the western mountains Rocky mountains, but I prefer the term Pacific mountains. I should therefore leave the term Rocky mountains for popular use in any vague sense and I should deem it wise to adhere in scientific literature to two names for the Stony mountains and the Park mountains. I should not use the term Cordilleras, for we have a term already in use in English which is its synonym—range, and I believe that it would be confusing to use the Spanish word. We need the term range for the Coast ranges and for the Desert ranges, each of which constitutes a system as I use the term. The Sierra Nevada system is a plateau system, not a range system. The Rocky mountain system is a range system; the Cascades constitute a volcanic system, etc., etc. I should speak of three kinds of systems: plateau systems, range systems and volcanic systems. I would name systems of mountains and describe them in three groups.

I would call all of the eastern mountains Atlantic mountains, and I would call all of the western mountains Pacific mountains, and I would call all of the lowlands between these mountains the North American basin.

The mountains south of the Rio Grande in Mexico I should call the Cordilleras, and the mountains south of Mexico I should call the Sierra Madre. The Sierra Madre constitute predominantly a volcanic system; the Cordilleras of Mexico constitute a range system. I should therefore apply the term Cordilleras to the range system of Mexico, because the term is the Spanish for range, but in the United States I should use the term range; and to the North in the British Dominion I should use the term range in preference to Cordilleras.

Yours cordially,

J. W. POWELL.

Prof. I. C. Russell,
University of Michigan,
Ann Arbor, Mich.

SAN FRANCISCO, CAL., April 27th, 1899.

PROF. ISRAEL C. RUSSELL,
University of Michigan,
Ann Arbor, Mich.

MY DEAR PROFESSOR:

I have read your letter of the 29th of March several times, and each time difficulties present themselves to the adoption of a single term that may be applied respectively to the (1) great mountain ranges that mark the western parts of North America (and of South America), (2) the smaller systems of the eastern parts, and (3) the intervening broad areas of relatively low country. Of minor divisions the usage and geography of a hundred years cannot easily be set aside.

Of course, there are very many inconsistencies in the present nomenclature, and yet people will cling to the names they have grown to recognize as belonging to certain mountains, ranges or chains of their earlier education, and which are incorporated in our literature.

Every American has some idea of the height and extent of the great mountain barrier and continental divide of North America simply designated on all maps as the "Rocky Mountains," and would, for instance, reject the belittling term "Stony Mountains." Assuredly he would look with much doubt upon the unusual term *cordillera*, which carries no specific physical idea and which would most likely be misunderstood and mispronounced.

In our immediate Pacific Coast system we have, in some regions, four distinct but closely parallel ranges of mountains, and yet the term "Coast Ranges" will hardly be displaced, although each may have a specific and even local name.

In the mountain nomenclature of our Spanish-speaking neighbors hence to Cape Horn, there are many inconsistencies similar to our own.

The volcanic range or ranges that run through Central America have a variety of names, and yet none of these names gives a clear and distinct idea that they are volcanic.

In some parts of South America we find no term indicating the *controlling character*, nor anywhere a term that conveys the idea of continental divide. Along the great backbone of the Andes we find in some regions the flanking ranges designated the Eastern

Cordillera and the Western Cordillera, and the great crest line itself simply "the Andes," which term is inconsistent in meaning with the volcanic character of the main range.

The difficulties of reconciling nomenclature in this whole matter, as in other geographic and hydrographic cases, are insurmountable if it is proposed to associate the geological character therewith or if scientific accuracy is demanded in other essential conditions. The difficulty you experience in selecting three names that will cover and describe (1) the great, unique and controlling features of the mountain systems of Western North America, (2) the smaller systems of the East and (3) the great drainage areas between them has been experienced by geographers, geologists and engineers.

At present it would seem best to adopt single terms so general that each would suggest a broad idea of location and character. This would, of course, indicate the necessity of appealing to some descriptive explanation. For the mountain systems I would suggest the general terms,

The Pacific Mountains or Continental Divide.

The Atlantic Mountains.

I would not use the term *cordillera;* it is not broad or comprehensive, and it is comparatively novel to our literature. It is applied to a hundred small ranges. Of course, the Rocky Mountains reach the Arctic, according to the Canadian maps, and it may be asked how far south they shall be reckoned, but they are comprehended with other systems in the general term the Pacific Mountains or Continental Divide.

I object to the term Basin. It is not descriptive of the regions between the mountain systems and it is too restricted. It might apply to the immediate locality in which the City of Mexico is unfortunately situated, or even to the different lake depressions in the great central plateau of Mexico. Nor would the term valley or valleys apply. It seems to me that the appropriate and comprehensive term is

The Continental Drainage Areas.

That carries with it an idea of size, location and character to the geographer, the geologist and the engineer.

Moreover these three terms so applied to North America would equally apply to South America.

These are the expression of the matter as it presents itself at this time; my future studies may probably suggest some modification.

Yours very truly, GEORGE DAVIDSON.

COMMENTS BY PROF. W. M. DAVIS.

It does not seem to me probable that the distinction between mountain system and mountain chain, adopted by Professor Russell from Dana's classification, will be generally followed—it is rather too definite. Most writers will use the two terms unsystematically; "chain," in particular, is a term of common usage that can not be easily limited by scientific definition. It is hardly possible that non-technical writers will give up such terms as ridge, range, system and chain, with which they have been long familiar, and content themselves at our request with "mountain, mountain group, mountain belt, mountain series." Moreover, if we enter the question of the origin of mountains as affording a basis for general descriptive terms such as those needed in a tripartite, continented division, we shall have to discuss many questions, interesting in themselves, but irrelevant to the matter in hand. The Appalachians cannot be safely defined to-day as of "post-Carboniferous" age, for it can hardly be questioned that they contain belts of Carboniferous, if not of Devonian deformation. Moreover, the Appalachians, as we see them, are for the most part of post-Cretaceous elevation; nearly all traces of their earlier deformations having been worn away over most of their area.

In view of these general considerations, "Eastern and Western Highlands" seem to me the simplest and most generally acceptable names for what Professor Russell calls "Atlantic and Pacific Cordilleras (mountains)." *Cordillera* is open to several objections; it is liable to be mispronounced unless spelled "Cordillyera," and it may be mispronounced even then; as defined by Professor Russell, it excludes the Allegheny plateau, the plateaus of Utah and Arizona, and the high-floored basins of Utah, Nevada, Idaho, and Washington; it is too specifically limited to regions of deformed structure, and hence is not satisfactory as a collective name for regions of whatever structure that possess to-day a considerable elevation; it is properly associated with regions of pronouncedly mountainous form, and hence is not a satisfactory name for the great Laurentian highlands of eastern Canada. *Highland* is safe against all these objections; it is a familiar and agreeable word; it applies to elevated regions of whatever structure; it is not too strictly defined in terms of geological date, or of topographic form. *Eastern* and *Western* seem much less open to misunderstanding than *Atlantic* and *Pacific;*

Coast ranges, the Sierra Nevada system, the Cascade system and another to be defined hereafter to the north, together with the Stony mountain system, the Park mountain system, the Wasatch system and the Desert mountain system. The Stony mountains and the Desert mountains are two well-defined systems geographically, and ought to have distinct names. The Rocky mountains is a general term used indefinitely to include the Park mountains and the Stony mountains and some other. It might be well to call all of the western mountains Rocky mountains, but I prefer the term Pacific mountains. I should therefore leave the term Rocky mountains for popular use in any vague sense and I should deem it wise to adhere in scientific literature to two names for the Stony mountains and the Park mountains. I should not use the term Cordilleras, for we have a term already in use in English which is its synonym—range, and I believe that it would be confusing to use the Spanish word. We need the term range for the Coast ranges and for the Desert ranges, each of which constitutes a system as I use the term. The Sierra Nevada system is a plateau system, not a range system. The Rocky mountain system is a range system; the Cascades constitute a volcanic system, etc., etc. I should speak of three kinds of systems: plateau systems, range systems and volcanic systems. I would name systems of mountains and describe them in three groups.

I would call all of the eastern mountains Atlantic mountains, and I would call all of the western mountains Pacific mountains, and I would call all of the lowlands between these mountains the North American basin.

The mountains south of the Rio Grande in Mexico I should call the Cordilleras, and the mountains south of Mexico I should call the Sierra Madre. The Sierra Madre constitute predominantly a volcanic system; the Cordilleras of Mexico constitute a range system. I should therefore apply the term Cordilleras to the range system of Mexico, because the term is the Spanish for range, but in the United States I should use the term range; and to the North in the British Dominion I should use the term range in preference to Cordilleras.

Yours cordially,

J. W. POWELL.

Prof. I. C. Russell,
University of Michigan,
Ann Arbor, Mich.

SAN FRANCISCO, CAL., April 27th, 1899.

PROF. ISRAEL C. RUSSELL,
University of Michigan,
Ann Arbor, Mich.

MY DEAR PROFESSOR:

I have read your letter of the 29th of March several times, and each time difficulties present themselves to the adoption of a single term that may be applied respectively to the (1) great mountain ranges that mark the western parts of North America (and of South America), (2) the smaller systems of the eastern parts, and (3) the intervening broad areas of relatively low country. Of minor divisions the usage and geography of a hundred years cannot easily be set aside.

Of course, there are very many inconsistencies in the present nomenclature, and yet people will cling to the names they have grown to recognize as belonging to certain mountains, ranges or chains of their earlier education, and which are incorporated in our literature.

Every American has some idea of the height and extent of the great mountain barrier and continental divide of North America simply designated on all maps as the "Rocky Mountains," and would, for instance, reject the belittling term "Stony Mountains." Assuredly he would look with much doubt upon the unusual term *cordillera*, which carries no specific physical idea and which would most likely be misunderstood and mispronounced.

In our immediate Pacific Coast system we have, in some regions, four distinct but closely parallel ranges of mountains, and yet the term "Coast Ranges" will hardly be displaced, although each may have a specific and even local name.

In the mountain nomenclature of our Spanish-speaking neighbors hence to Cape Horn, there are many inconsistencies similar to our own.

The volcanic range or ranges that run through Central America have a variety of names, and yet none of these names gives a clear and distinct idea that they are volcanic.

In some parts of South America we find no term indicating the *controlling character*, nor anywhere a term that conveys the idea of continental divide. Along the great backbone of the Andes we find in some regions the flanking ranges designated the Eastern

"of North America" may be added in the early use of the terms, but need not be retained afterwards.

"North American basin" is too long a name if all three words are used, and too indefinite if the first two are dropped, as they must be in frequent references to the region. The medial basin, or the medial depression of North America would be, perhaps, more satisfactory; but in the absence of practice on any fixed usage, it is difficult to announce a very definite choice.

I am obliged to Professor Russell for setting up his wickets and letting us bowl at them, and shall be interested to know whether the umpire—General Scientific Opinion—declares us to be wide of the mark or not.

PHILADELPHIA, May 15, 1899.

DR. PAUL J. SARTAIN,
Chairman Publication Committee,
Geographical Society of Philadelphia.

MY DEAR DR. SARTAIN:

Our President, Mr. Bryant, has been pleased to refer to me for comment or criticism the enclosed scheme of classification, or rather nomenclature, of the dominant physical features of the North American Continent, submitted to our Society by Prof. Israel C. Russell, and with the request that it be fully open to review. I take advantage of this free request to make a few observations on the special points presented: namely, to call the eastern mountain associations of the continent the "Atlantic Mountains" (or Cordillera), the western mountain associations the "Pacific Mountains" (or Cordillera), and the intervening low-lying region or depression the "North American Basin." In my judgment, the scheme of classification here presented, while it may be of service in one direction, is open to material objection, both from a literary and "structural" point of view, and I do not quite see where it would facilitate the work, either of the instructor or of the student. It seems to me that in all our scientific work we are already hampered by an overdose of both "comprehensive" and "specialized" (or skeletonized) classifications—classifications of groupings and of dismembered parts—which but negatively take the place of the genuine non-scientific classification, with a moment to spare in "plain English" for further explanation. If it is at a certain time convenient to refer to all the mountains of the United

States west of the Mississippi as the Pacific mountains, there can hardly be any objection, it seems to me, for doing so; but it is not made clear to me why this should involve a special scheme of classification. The Rocky Mountains, as such, are well known throughout the land as a piece of structure, for their scenery, hardships, etc.; the Sierra Nevada, the Cascade Mountains, the Coast Range, etc., are hardly less prominent features. It is true that the Rocky Mountains have, to an extent, a dual signification, being geographically (largely) restricted to the interior backbone elevations of the continent, while in the popular mind they take in all the mountains that follow range upon range to the Pacific border. It may be advisable, through some statutory or geographical legislation, to restrict the term to the interior ranges, and then, if necessary or convenient, the popular "Rocky Mountain system" might be used as a passing term to cover all the western mountains. At this moment I do not see why all these mountains, which are structurally and physiographically so different, should be referred to collectively, except in the broadest or a purely non-significant reference. A decided disadvantage suggests itself to me from such a collective grouping, as it would almost certainly lead to a false conception of the physiographical relations of the broad region which mountains cover. Even for the case of the much more closely related Pyrenees, Alps, Carpathians, Balkans, etc. (*et* Hindu-Kush, Himalayas), it has not been found advantageous by geographers to frame a collective physiographic term. Incidentally it should be noted that the main bulwark of the true Rocky Mountains, in the United States at least, lies much nearer—by 300–500 miles—to the center of the continent than to the Pacific coast; and in Mexico, so far as our present knowledge of the orographic relations of that region indicates, it defines the Atlantic border rather than the Pacific.

The eastern or "Atlantic Mountains," which are geographically at least much more of a unit than the mountains of the west, have long been known as the "Appalachians," a term which, it seems to me, meets all the requirements of the case. "Atlantic" and "Pacific," apart from all other considerations, are always open to the objection which comes from a direct but not exclusive association. South America has its Atlantic and Pacific mountains as well as North America; therefore, by the adoption of a term which is related to a *locus* we should be immediately obliged to qualify or to specify, and the reverse of this is aimed at in the paper that is presented.

The designation of the interior region of the continent as the "North American Basin" does not appeal to me favorably; in my own lectures, while I have used the term sometimes, I have preferred "Central Plain or Valley" or "Great Central Valley," to which objection can also well be made. But here, again, it does not seem to me that special value would attach to any purely classificatory term, as there is no absolutely distinct or concrete physiographic feature to define. A combination of good English words in one form or another will meet the requirements of both specialist and non-scientific layman.

My own preferred classification of the dominant features of the United States is: (1) the Coastal Plains; (2) the Appalachians; (3) the Central Valley; (4) the Rocky Mountains; (5) the Great Basin; and (6) the Mountains of the Pacific Slope. To these, for the continent at large, may be added (7) the Mexican Plateau, (8) the Labrador Highland (or shield (*Schild*) of Prof. Suess), and (9) the Arctic Depression.

However students may differ from Prof. Russell in the scheme of classification which he presents, or in their views regarding the necessity for any special classification, they are at least under obligation to him for bringing so interesting a matter under consideration and discussion; and, doubtless, his paper will be the fountain-spring for the opening up of discussions of broader import, to which the study of geography has been too long a stranger.

Sincerely yours,

ANGELO HEILPRIN.

CONCLUSION.

The replies printed above, to my requests for criticisms of the attempt presented in the opening essay, to arrive at a general agreement concerning the names to be applied to the major geographical features of North America, render it evident that geographical nomenclature cannot be directed in the manner I had hoped. Evidently the old process of following precedents, or rather, of many persons following their individual inclinations, and common usage gradually favoring a certain series of names without logical connection, is the only practicable way of establishing a widely current nomenclature for even the larger features of our continent. If this process of elimination resulted in the "survival of the fittest," perhaps no better plan could be devised. Unfortunately, however, the fittest, judging from my own narrow point of view, is by no means sure to endure. I have no decided preference for the terms Atlantic mountains, etc., proposed in the first of this series of articles, over the equally appropriate, or possibly even more desirable names suggested by my colleagues, if a generally acceptable system could be agreed upon. It is the lack of harmony, or rather the absence of a majority, that seemingly renders an *a priori* system of geographical nomenclature impracticable.

[Copy of Message Placed in Cask.]

MELVILLE-BRYANT DRIFT CASK

To Determine the Direction of Arctic Currents

Sent out Under the Auspices of the Geographical Society of Philadelphia.

Report on Arctic Currents.
Raport over Ishav's strömme.
Mittheilung über die Strömungen des arctischen Oceans.
Rapport sur les courants arctiques.
Thrown overboard by

Name.....

Vessel.....

Date.....

Latitude.....

Longitude.....

Number of Cask.....

DIRECTIONS

Use hard lead pencil or black ink. Roll the paper and place it in a dry tube. Cork the tube tightly, seal it with wax, tar or other material, insert in wooden case provided and place same in the cask.

Fundet af (giv navn, dato samt plads).
Gefunden von (man gebe Namen, Datum und Ort an).
Trouvé par (indiquer le nom, date et lieu).
Found by

Finder.....

Date.....

Locality.....

The finder will please send this paper to the nearest United States Consul at his home port, or forward it direct to the "Geographical Society, Philadelphia, United States of America."

Finderen heraf bedes forbindtligst at afsende samme, enten til De Fovenede Stater's consul i hans hjem-havn eller direkte til det "geografiske selskab i Philadelphia, De Fovenede Stater, Nord-Amerika."

Der Finder dieses Papieres wird ersucht dasselbe an dem nächsten Consul der Vereinigten Staaten zu schicken oder direct an die "Geographical Society, Philadelphia, United States of America."

La personne qui trouvera ce papier est priée de l'envoyer au plus proche consul des États Unis, ou directement à la "Geographical Society, Philadelphia, United States of America."

Drift Casks to Determine Arctic Currents.

BY

HENRY G. BRYANT.

(Read at the VII International Geographical Congress at Berlin, 1899.)

There is no subdivision of modern geography which offers a more promising field to one interested in original research than those studies and phenomena grouped under the term oceanography. We have only to note the prominent position assigned to this branch in the present gathering, and the eminent names associated with the discussions in this department, to understand the importance of the subject.

As a slight contribution I venture to present to the Congress some details of the inauguration of an experiment to obtain data relating to Arctic currents, by means of drift casks, set adrift in the Arctic sea north of Alaska. This project was planned by Rear Admiral George W. Melville, U. S. N., and has recently been carried into effect by the Geographical Society of Philadelphia. Owing to the recent war, and other causes, the execution of the project was somewhat delayed; and it was only during the past spring that the final arrangements were completed and the casks sent to the far North.

When Dr. Fritjof Nansen visited Philadelphia in March, 1898, he delivered an address before one of our learned societies on "Some of the Scientific Results of the Voyage of the Fram." Admiral Melville, whose connection with the Jeannette expedition is well known, contributed a paper at the same meeting on "The Drift of the Jeannette," in which, after eulogizing the intrepid Norwegian, to whose heroic devotion was mainly due the successful outcome of the Fram expedition, he drew attention to the correlation between the drift of Captain DeLong's vessel and that of the Fram—pointing out that the latter took up and continued the drift of the Jeannette, from a point comparatively near where that vessel was crushed in the ice on June 13th, 1881. After recommending that any future expedition wishing to emulate the achievements of the Fram should approach the circumpolar area by way of Bering Sea, Admiral Melville suggested that much valuable data relating to Arctic currents could be secured by setting adrift in the sea north of Alaska a series of

specially constructed casks, containing proper records. These casks might be confidently expected to put in an appearance in due time, on the other side of the unexplored area, in waters frequented by human kind. In this connection he remarked: "I do believe, however, from the information we have gained from the drift of the Jeannette and of the Fram, that vessels of any kind, such as casks or drift wood, will come out by way of Spitzbergen—though not necessarily across the Pole. The only reason for sending men in ships is that they may be observers to make a daily record of events, . . . recording all the phenomena proper on such an expedition. But for this, I say, a hundred oaken casks, properly numbered, made after the manner of a beer keg of twenty gallons capacity, properly hooped, and the ends extended out to complete a parabolic spindle, would demonstrate the drift. At the end of four or five years we might begin to look for the beer kegs between Spitzbergen and Greenland."[1]

This proposed method of studying Arctic currents without endangering human life, having been brought to the notice of the Geographical Society of Philadelphia, that body determined to undertake the project. In view of the exigencies of a long voyage on the floe ice, special attention was given, in the construction of the casks, to shape and strength of materials. Thus, to more readily escape crushing by the ice, as intimated above, their shape conformed to that of a parabolic spindle, while they were made of heavy oak staves one and one-quarter inches thick, encompassed by iron hoops three-sixteenths of an inch thick and two inches wide. A coating of black "half stuff" (pitch and resin mixed) was then applied. In addition to the preservative qualities of this coating, the thickness of the wood and metal used is believed to be sufficient to resist the attrition of the ice and the effects of corrosion, during the long drift. The staves, so tapered as to form the spindle, were covered on the ends by light galvanized cast-iron caps, held in place by an iron rod, five-eighths of an inch in diameter, extending the length of the cask and secured by conical nuts at each end. As above stated, a heavy coating of black waterproofing material was applied to the casks to guard against corrosion and decay. From the color used, they will be more easily seen and will also the more readily sink—under the action of the summer sun—into the body

1. *Vide* "A Proposed System of Drift Casks to Determine the Direction of the Circumpolar Currents," and "The Drift of the Jeannette," by Com. Geo. W. Melville, U. S. N., *Bulletin*, Vol II, No. 3, April, 1898.

of the ice and be preserved from destruction by crushing. The number of each cask was etched into the wood as well as painted on the outside. In accordance with the instructions of the originator of the plan, the vessels must be placed on the heavy floe ice. If set adrift in open water, they would be too much at the mercy of winds and waves, whereas, by being deposited on heavy ice which is more affected by under currents, they will probably be carried on a more correct drift. A reinforced bung-hole with bung was provided, and through this the message bottle was inserted– a quantity of shavings having first been placed inside to prevent the jostling about of the bottle. This latter consisted of a narrow cylindrical tube made of flint glass and technically known as an "ignition tube," accompanying which were suitable corks and sealing wax. As an additional precaution, these tubes were in turn enclosed in cases made of maple wood provided with screw tops.

The message paper enclosed in this way was printed on linoleum paper, by a permanent blue-print process which renders it practically impervious to salt water. The enclosed message was printed in the English, Norwegian, German and French languages and embodied the following particulars :—

(a) Space for name of vessel and master assisting in distribution, date, number of cask and latitude and longitude of point where it was set adrift.

(b) Directions as to filling in record and sealing up tube.

(c) Blank space for insertion of name of finder, date and locality where cask was picked up.

(d) Clause requesting finder to forward message paper to the nearest United States Consul at his home port, or to send it direct to the Geographical Society of Philadelphia. (See page 70.)

Accompanying each consignment of casks, was a set of printed instructions to masters of vessels engaged in their distribution. These directions embodied in the main Admiral Melville's ideas on the subject. In a paper prepared for the Geographical Society of Philadelphia he gives his views on this question as follows :—[2]

"The casks being properly prepared and numbered . . . I would recommend that they be carried on a government vessel through Bering Strait, and set adrift in sets of five, numbered consecutively ; commencing with the first five, at or near Herald Island,

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2 Ibid., p. 41.

then proceeding to the northward, along the eastern edge of the ice pack, until the highest safe latitude is obtained—say latitude 75° N. longitude 170° W. from Greenwich. . . . At this point final sets of casks are to be set adrift, to demonstrate if possible the currents to the eastward or northward and eastward, if any there prevail."

Captains of vessels were requested, if opportunity presented, to distribute a few casks as far to the eastward as Banks Land; but were enjoined not to place any adrift on the ice adjacent to the Point Barrow district in Alaska, where purely local currents running east and west are known to exist, as was illustrated by the extraordinary drift of the steam whaler Narvarch during the winter of 1897–1898.

In the important work of distributing the casks, the promoters of the enterprise profited by the valued co-operation of the U. S. Revenue Cutter Bear, which makes an annual cruise as far north as Point Barrow in the interest of the American whalemen. Twenty casks were carried north on the Bear, and the others were distributed among the vessels of the Pacific Steam Whaling Company's fleet and those owned by Messrs. Liebes & Co., of San Francisco. It was understood that a majority of the casks would be put adrift during the months of August and September of the present year, although the time when this would take place would depend on the ice conditions, which vary from year to year.

What the ultimate fate of these silent, inanimate messengers will be, when once entrusted to the elemental forces of the vast, unknown north, no one can predict with assurance. We trust a certain percentage will eventually make their way across the unexplored area and be picked up and reported. In the event of a fair percentage coming through, the resulting tabulated data, showing the time consumed by the casks in their drift between known termini, will undoubtedly be of value in determining the speed of circumpolar currents.

If this experiment can be repeated on a like scale next year by the Society, as it is hoped can be done, the possibility of definite results will be greatly enhanced. Admiral Melville firmly believes the fugitive casks will justify our hopes in them, remarking:

"There is no doubt but that they will come out somewhere. Siberian driftwood has been found on the northeastern shores of Bennett Island, on the northeast point of Nova Zembla, on the eastern coast of Franz Josef land, on the eastern shores of Spitz-

bergen and, possibly, in the drift of the eastern side of Greenland. A strong current is known to exist at certain seasons of the year to the southward and westward, between the northern end of Nova Zembla and the southern side of Franz Josef land, and between the southern side of Spitzbergen and Bear Island—dropping the stones from the polar pack which form the shoal of 300 fathoms between the above islands.

"We may look for the casks on any of the above shores or in the above mentioned drifts, and also for the possibility of demonstrating a drift to the eastward or to the northward and eastward, finally coming out by way of Smith's Sound and Kennedy Channel and Baffin's Bay, as well as by the slow drift through the North American Archipelago to the coast of Labrador."

It is not at all improbable, as intimated by Admiral Melville in the last clause, that some representatives may be carried by the northeastern or North American drift along the devious route taken by McClure forty-seven years ago in achieving the Northwest Passage. If a considerable number survive the dangers of the northwestern or Siberian drift, and are picked up in the East Greenland ice, the fact may be taken as helping to prove the permanence of the drift current which carried the Fram so far on her course across the Polar Sea.

The reports from the gallant officers of the Bear and the captains of the whaling fleet will be received within a year, and will show what success has attended the distribution of the casks in northern waters. From the marked interest in the success of the experiment manifested by all concerned in the work, it is believed the reports will show that the first part of the enterprise has been inaugurated in an intelligent and trustworthy manner.

In venturing to submit to the Congress these details of a method of investigating Arctic currents, I respectfully solicit the co-operation of the members—especially those representing the seafaring peoples of northern Europe—to the extent that they will assist in the dissemination of knowledge concerning the experiment among the merchant marine of their respective countries.

Let me indulge in the hope, then, that when, the full measure of time having passed, the survivors of this miniature flotilla shall appear in waters frequented by man, they may be recognized and rescued after their long journey through the mysterious unknown.

Letter from Daniel T. Potts, a Pioneer Trapper, to his brother, Robert T. Potts,

OF MONTGOMERY COUNTY,

PENNSYLVANIA,

With historical annotations, and notes identifying localities and persons named, by Dr. Elliott Coues, Editor of Lewis and Clark's Expedition, Expedition of Zebulon M. Pike, Henry's and Thompson's Journal, etc.

The following letter is deemed worthy of preservation in permanent form, inasmuch as it contains one of the earliest descriptions of the region in Wyoming, south and east of the Yellowstone National Park. The writer evinces an appreciation of natural scenery not always found among "voyageurs" and trappers; although the stupendous uplift in northwestern Wyoming, where converging ranges form an elevated watershed, the birthplace of rivers flowing into the Gulf of Mexico, the Gulf of California and the Pacific, presents aspects of nature which appeal to the most prosaic. In the lapse of years, there have been changes in names in some of the places mentioned; but there is no difficulty in identifying the localities referred to. Thus, the writer had Fremont's Peak in mind when he describes the apex of "Mt. Columbia" as "reflecting the brilliancy of the diamond." The letter further gives us an insight into the perils and hardships of those old-time trappers who played so important a role in the conquest of the great west, and who have left behind such meagre material in the way of written records. From other sources, we learn that these trapping expeditions were pecuniarily successful; but our correspondent shows that he was animated by the true spirit of the explorer, as well as the desire for gain; for after confessing to a feeling of homesickness betimes, he says he has decided to remain two years longer in the wilderness, being influenced mainly by the desire to explore the unknown region southwest of the Great Salt Lake, which he says "has never yet been visited by any white person."—H. G. B.

ROCKY MOUNTAIN, July 16, 1826.

DEAR AND RESPECTED BROTHER:

After I left Philadelphia I was taken with a severe spell of rheumatism, which continued with me for about two months. I arrived in Illinois on the 1st of July in the same year, where I remained until March following, when I took my departure for Missouri; from thence I immediately entered on an expedition of Henry[1] and Ashly,[2] bound for the Rocky Mountain and Columbia River. In this enterprise I consider it unnecessary to give you all the particulars appertaining to my travels. I left St. Louis on April 3d, 1822, under command of Andrew Henry, with a boat and one hundred men, and arrived at Council Bluffs on May 1st; from thence we ascended the river to Cedar Fort,[3] about five hundred miles. Here, our provisions being exhausted, and no prospect of game near at hand, I concluded to make the best of my way back in company with eight others, and unfortunately was separated from them. By being too accessary in this misfortune, I was left in the prairie without arms or any means of making fire, and half starved to death. Now, taking into consideration my situation—about three hundred and fifty miles from any frontier post—this would make the most cruel heart sympathize for me. The same day I met with three Indians, whom I hailed, and on my advancing they prepared for action by presenting their arms, though I approached them without hesitation and gave them my hand. They conducted me to their village, where I was treated with the greatest humanity imaginable. There I remained four days, during which time they had many religious ceremonies too tedious to insert; after which I met with some traders, who conducted me as far down as the —— village, this being two hundred miles from the post. I departed alone, as before, with only about one-fourth pound suet, and in six days reached the post, where I met with General Ashly, on the

1. Andrew Henry is a trader of whom little is known beyond what is given of him in Irving's Astoria. He has often been confounded with the Alexander Henry whose Journal I lately edited. Andrew Henry first appears at a fort at the Three Forks of the Missouri, whence he was driven by Indians to establish, in 1810, Fort Henry, on Henry's or the North fork of Snake river, found abandoned when the overland Astorian party came there, October 8, 1811.

2. "Ashly" is General Wm. H. Ashley, one of the most enterprising and successful fur traders of St. Louis, Lieutenant-Governor of Missouri in 1820-24, member of Congress, etc. His expedition of 1822, which Potts accompanied, is a specially notable one.

3. This Cedar fort, also called Fort aux Cèdres, a post of the Missouri Fur Co., was on the Missouri river in the vicinity of present Chamberlain, seat of Brulé county, South Dakota. See my ed. of Lewis and Clark, p. 122; my Larpenteur, p. 280; also Maximilian's Travels, ed. of 1843, p 147.

second expedition, with whom I entered for the second time, and arrived at the mouth of Yellow Stone about the middle of October. This is one of the most beautiful situations I ever saw.[4]

From this I immediately embarked for the mouth of Muscle Shell,[5] in company with twenty-one others, and shortly after our arrival eight men returned to the former place. Here the game being very scarce, the prospect was very discouraging, though after a short time the buffaloes flocked in great abundance, likewise the mountain goats; the like I have never seen since. Twenty-six of the latter were slain in the compass of one hundred yards square in the space of two hours. During the winter the buffaloes came into our camp, one of which I was induced to charge upon by our company, without firearms, at first with a tomahawk only. After approaching very close, the bull prepared for action with the most dismal looks and sprang at me. When within one leap of me, I let fly the tomahawk, which caused him to retreat. After returning to our cabin, I was induced to make a second attempt, armed with a tomahawk, knife and spear, accompanied by five or six others armed. After traveling a short distance, we discovered the beast, and, in a concealed manner, I approached him within fifty yards, when he discovered me and made a rapid retreat, though, there being much fallen timber, I soon overtook him. Finding there was no escape, he made battle. On the first onset I put out one eye with the spear, the second failing in the other eye; on the third I pierced him to the heart and immediately despatched him.

The winter set in early, and the ice on the river froze to the immense thickness of four feet, and the snow of an ordinary depth. The river did not discharge itself until the 4th of April; on the 5th we were visited by a party of Indians, and on the 6th we embarked in canoes for the River Judah.[6] In about one day's travel we discovered where a party of Indians had wintered who were our

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4. The original and long the most famous establishment on the Missouri at or near the mouth of the Yellowstone was Fort Union, begun in 1829, finished in 1833, and occupied till 1866. Fort William was another post, built in Sept.-Nov., 1833; the original structure was a temporary one of wood, soon replaced by an adobe structure, which was used until 1858. In 1843 there was another post called Fort Mortimer on the site of Fort William, and on the same spot, in 1866, the United States military Fort Buford started as a one-company post. Full particulars of all these establishments may be read in my Larpenteur.

5. The Musselshell river, a considerable tributary of the Missouri, falling in from the south at lat. 47° 27′, near long. 107° 53′; discovered by Lewis and Clark, May 20, 1805. The name is a translation of the Indian designation.

6. "River Judah" is Judith river, discovered by Lewis and Clark, May 29, 1805, and named for Miss Julia (or Judith) Hancock, of Fincastle, Va., who afterward became Mrs. Clark. It falls into the Missouri from the south, in Fergus county, Montana, about lat. 47° 44′, long. 109° 39′.

enemies, but fortunately had not discovered us. On the 11th I was severely wounded through both knees by an accidental discharge of a rifle, whereby I was obliged to be conducted to our establishment at the mouth of Yellow Stone; here I remained until September. We were favored by the arrival of Major Henry, from the Aricarees, who had departed from this place with a small brigade for the relief of General Ashly, who was defeated by that nation, with the loss of sixteen killed and fourteen wounded out of forty men. After Major Henry joined them and the troops from Council Bluffs, under command of Colonel Levengworth,[7] they gave them battle. The loss of our enemy was from sixty to seventy; the number of wounded not known, as they evacuated their village in the night. On our part there were only two wounded, but on his return he was fired upon by night by a party of Mannans, wherein two were killed and as many wounded. Only two of our guns were fired, which dispatched an Indian, and they retreated. Shortly after his arrival we embarked for the Big Horn,[8] on the Yellow Stone, in the Crow Indian country. Here I made a small hunt for beaver. From this place we crossed the first range of Rocky Mountain into a large and beautiful valley, adorned with many flowers and interspersed with many useful herbs. At the upper end of this valley on the Horn is the most beautiful scene of nature I have ever seen. It is a large boiling spring, at the foot of a small burnt mountain, about two rods in diameter, and depth not ascertained, discharging sufficient water for an overshot mill and spreading itself to a considerable width, forming a great number of basins of various shapes and sizes, of incrustations of sediment, running in this manner for the space of two hundred feet, there falling over a precipice of about thirty feet perpendicular into the head of the Horn or confluence of Wind River; from thence across the second range of mountains to Wind River Valley. In crossing this mountain I unfortunately froze my feet, and was unable to travel from the loss of two toes. Here I am obliged to remark the humanity of the natives (the Indians) towards

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7. "Levengworth" is Colonel Henry Leavenworth, who was colonel of the 3d U. S. Infantry at the time of which Potts speaks, and for whom Fort Leavenworth, Kan., was named. The engagement to which Potts alludes is historical.

8. The Bighorn is the principal branch of the Yellowstone, reaching the main river from the south through the present Crow Indian reservation, between Yellowstone and Custer counties, Mont. It takes this name in Wyoming from the confluence of Wind river with the Popoagie, the former being the main stream. The Bighorn was discovered by Capt. Clark (of Lewis and Clark), July 26, 1806. The name refers to the Rocky Mountain sheep or bighorn, an Indian name of which is *ahsahta* or *arsata*, also sometimes applied to the stream. By a curious blunder of translating the French equivalent, *grosse corne* the stream was once called "River of Large Corn." See my Larpenteur, p. 39.

me, who conducted me to their village, into the lodge of their chief, who regularly, twice a day, divested himself of all his clothing except his breech-clout and dressed my wounds until I left them.

Wind River[9] is a beautiful transparent stream, with hard gravel bottom, about 70 or 80 yards wide, rising in the main range of Rocky Mountains, running E. N. E., finally north through a picturesque small mountain, bearing the name of the stream; after it discharges through this mountain it loses its name. The valleys near the head of this river and its tributary streams are tolerably timbered with cottonwood, willow, etc. The grass and herbage are good and plenty, of all the varieties common to this country. In this valley the snow rarely falls more than three or four inches deep, and never remains more than three or four days, although it is surrounded by stupendous mountains. Those on S. W. and N. are covered with eternal snow. The mildness of the winter in this valley may readily be imputed to the immense number of hot springs which rise near the head of this river. I visited but one of those which rise to the south of the river in a level plain of prairie, and occupies about two acres; this is not so hot as many others, but I suppose to be boiling, as the outer verge was nearly scalding hot. There is also an oil spring[10] in this valley, which discharges 60 or 70 gallons of pure oil per day. The oil has very much the appearance, taste and smell of British oil. From this valley we proceeded by S. W. direction over a tolerable route to the heads of Sweet Water, a small stream which takes an eastern course and falls into the north fork of the Great Platt, 70 or 80 miles below.[11] This stream rises and runs on the highest ground in all this country. The winters are extremely and even the summers are disagreeably cold. We passed here about the middle of July last; the ice froze near half an inch in a kettle. Notwithstanding the intense cold,

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9. Wind river was first ascended by the outgoing overland Astorians under Wilson Price Hunt, Sept. 9-14, 1811. The date of which Potts writes is an early one for the use of the name; but I have never ascertained exactly when it was bestowed upon this portion of the Bighorn above the Popoagie. The name is still current. The course assigned by Potts to Wind river, "E. N. E.," should read E. S. E.; but he is quite right in saying that after it discharges through the mountain "it loses its name," *i. e.*, is called the Bighorn.

10. No doubt identical with the oil spring noted by Larpenteur, p. 40, as near the confluence of Popoagie creek with Wind river.

11. The Sweetwater, still so called, is that branch of the North Platte which heads in the vicinity of South Pass and falls into the North Platte (which Potts calls "Great Platt") a few miles below the famous Independence Rock. "The highest ground" of which Potts speaks is the South Pass, here the Continental Divide. The Sweetwater was discovered and part way descended by the incoming overland Astorians under Robert Stuart and Ramsay Crooks, Oct. 26 and following days, 1812. No name was then given to it, however, and the appellation of Sweetwater is of later date—not far from that of which Potts writes.

this country is well covered with grass, herbage and numberless Alpine plants. After crossing the above-mentioned stream, we took a more westerly direction over high rolling prairies to a small branch of a considerable river, known to us by the name of Seet Kadu, and to Spaniards by Green River, and is supposed to discharge itself into the Bay of California.[12] This river has a bold running current, 80 or 90 yards wide, and bears a S. E. direction. It falls from the Rocky Mountains in many small rivulets on which were considerable beaver. This valley, like all others I have seen in this country, is surrounded by mountains; those to S. W. and N. are covered with eternal snow near the tops. Columbia Mountain,[13] lying N., is the highest I ever saw, and perhaps the highest in North America. It stands rather detached and majestic, beginning abruptly towards the E., and terminating towards N. W. Its tops are the repository of eternal winter. In clear weather its appearance is truly sublime, and reflects the brilliancy of the diamond in its various colors. This mountain gives rise to many streams; the principal are the Yellow Stone and Wind River.

After passing from this valley in a S. W. direction we had very good travelling over an inconsiderable ridge; we fell on a considerable river, called Bear River,[14] which flows to the S. in the Utaw Mountains, bears N. 80 or 90 miles, when it turns short to the S. W. and S. and, after passing two mountains, discharges itself into the Great Salt Lake. On this river and its tributary streams, and adjacent country, we have taken beaver with great success. Since the autumn of 1824, you have no doubt heard, and will hear by the public prints, of the furs brought in by General Ashly, which were the product of our toils. The first valley as you approach from the head of the river is a small, sweet lake about 120 miles in circumference, with beautiful clear water, and when the wind blows has a splendid appearance. There is also to be found in this valley a considerable sour spring near the most northerly point of the river. The valley is scantily supplied with timber, as is the case with the

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12. This supposition is correct; the stream is present Green river, which, with Grand river, composes the Colorado of the West, which empties into the Gulf of California. The curious term "Seet Kadu," used by Potts, is one of many variants of the Indian name, among which I have noted Siskadee, Siskede, Sheetskadee, Seedskedee, Quesquidi, etc. The word is said to mean prairie hen (*i. e.*, the sage grouse, *Centrocercus urophasianus*).

13. Evidently Fremont's Peak, the S. E. culmination of the Wind River range. But this can hardly be said to give rise to either Wind river or the Yellowstone, unless, indeed, we extend Potts' term, "Columbia mountain," to include the whole Wind River range and some mountains contiguous on the N. W.

14. Present name of the well-known tributary of Great Salt Lake.

most of the low grounds of this country. The second, or Willow Valley, is better supplied on this point—this valley has been our chief place of rendezvous and wintering ground. Numerous streams fall in through this valley, which, like the others, is surrounded by stupendous mountains, which are unrivalled for beauty and serenity of scenery. You here have a view of all the varieties, plenty of ripe fruit, an abundance of grass just springing up, and buds beginning to shoot, while the higher parts of the mountains are covered with snow, all within 12 or 15 miles of this valley. The river passes through a small range of mountains and enters the valley that borders on the Great Salt Lake. The Great Salt Lake lies in a circular form from N. E. to N. W., the larger circle being to S. ; it is about 400 miles in circumference, and has no discharge or outlet ; it is generally shallow near the beach, and has several islands, which rise like pyramids from its surface. The western part of the lake is so saturated with salt, as not to dissolve any more when thrown into it. The country on S. W. and N. W. is very barren, bearing but little more than wild sage and short grass. The S. E. and E. are fertile, especially near the outlet of the Eutaw Lake and Weber's River. The former is about 30 yards wide at its mouth, the latter from 50 to 60, and very deep. This river rises to the E. in the Eutaw Mountains, and in its course passes through three mountains to where it enters the lake. We expect to start in a short time to explore the country lying S. W. of the Great Lake, where we shall probably winter. This country has never yet been visited by any white person—from thence to what place I cannot say, but expect the next letter will be dated at the mouth of the Columbia. My long absence has created a desire to hear from you, as well as the rest of my people, also my associates. I have been on the very eve of returning this summer, but owing to this unexplored country, which I have a great curiosity to see, I have concluded to remain one or two years. We celebrated the 4th of July by firing three rounds of small arms, and partook of a most excellent dinner, after which a number of political toasts were drunk.

DANIEL T. POTTS.

NOTE.

The following biographical data, relating to the author of the above letter, are furnished by a great-niece of the writer, Miss Mary J. Walker, of New Centreville, Chester Co., Penna.:

Daniel Trotter Potts was descended from David and Alice Potts, early settlers of Pennsylvania, and was the youngest child of Zebulon and Martha Trotter Potts. His father was an active patriot during the Revolution and subsequently held the offices of Judge of the Court of Common Pleas and State Senator. Daniel T. Potts, his son, was born in Plymouth Township, Montgomery County, and together with his three brothers was regarded as a daring spirit, fond of adventure and the pursuit of wild game. He was also of an inventive turn of mind and spent much time and thought on the chimera of Perpetual Motion. It is related that on one occasion he was so intent on one of his experiments that he forgot his duties when in charge of a flour mill, which he worked in partnership with his brother; and, as a result, the mill was saved from destruction by fire only by the timely alarm of a neighbor. This was in 1810.

His love of adventure led him to leave his home in 1821 and to join a party of fur traders and explorers of the western wilderness. He never returned to his native State. Several letters were received by his brother Robert from him; the last one being sent from New Orleans where he was sick, in want of money and desirous of coming home. He was directed to apply to a merchant of New Orleans with whom his brother had business relations, and the merchant was authorized to supply him with money to meet his necessities. The money was never called for and nothing more was ever learned of him by his family.

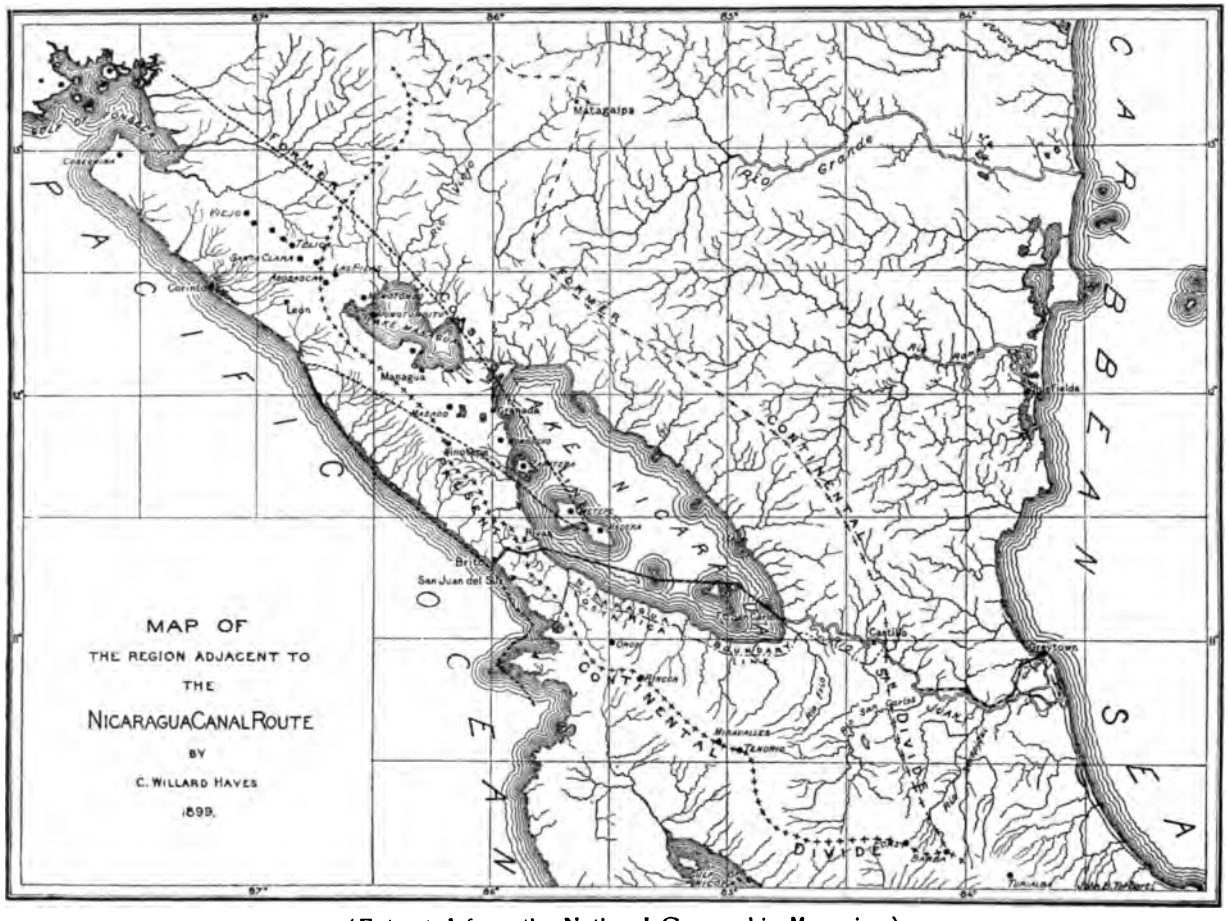
In Memoriam.

Dr. Daniel G. Brinton.

WHEREAS, The Geographical Society of Philadelphia, in common with a number of scientific societies of this city, is called upon to deplore the death of Dr. Daniel G. Brinton, our late fellow-member and Vice-President,

Therefore, Resolved, That the Geographical Society of Philadelphia hereby expresses its sense of loss in the death of Dr. Brinton, whose able services were always at the disposal of the Society, and desires to put on record its admiration for his varied and profound attainments as a scholar, as well as for the genial and sympathetic social qualities which endeared him to all the members of this Society.

Resolved, That this resolution of regret be spread upon the minutes of this Society, and a copy be prepared and sent to the family of Dr. Brinton.



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The Nicaragua Canal in Its Geographical and Geological Relations.

A Question as to the Permanency of the Proposed Canal.

BY
ANGELO HEILPRIN,
Late President of the Geographical Society and Professor of Geology at the Academy of Natural Sciences, of Philadelphia.

I.

THE VOLCANIC PHENOMENA OF THE REGION OF THE PROPOSED CANAL.

Certain phases of the Nicaragua Canal project, in which the geographer and geologist are more particularly interested, have thus far hardly received more than passing consideration by the experts who have reported upon the undertaking. And yet these phases deal, perhaps, more directly with the vital existence of the enterprise than any other, and should have received their full measure of attention in the first instance. When, in 1850, Mr. E. G. Squier, then Chargé d'Affaires of the United States to the Republics of Central America, announced to the American Association for the Advancement of Science, that in the plain of Leon, in Nicaragua, the "Almighty hand has smoothed the way for the grandest enterprise which human daring has conceived, and which human energy seems now on the eve of accomplishing, the opening of a

ship-canal between the oceans," the late Prof. Benjamin Silliman inquired what importance was to be attached to the objection that the country to be traversed by the projected canal was of a volcanic nature. The facts that appertain to this inquiry are, indeed, the *crux* to the problem.

The Nicaragua Canal, in whatever way conceived, must necessarily traverse the continuously volcanic tract that binds Costa Rica with Salvador, and this tract has been during the period of the last three-quarters of a century probably the most violently eruptive of any in the Western Hemisphere. Indeed, if the number of active and semi-active volcanoes occurring there, considered in connection with the explosive manifestations which have marked their past history, be taken as an index of present and future potentiality, it might be truly said that the region stands but little behind that which has the reputation for the greatest catastrophic effect in the world—the region of the Molucca Seas. It was in this tract, in 1883, that through the eruption of Krakatoa—a volcanic mountain which had hitherto hardly risen to even modest fame—was visited upon the earth probably the greatest natural catastrophe of which history makes record, and of which it has thus far been impossible to ascertain the full physical significance. One or more islands were completely shattered, and the "tidal wave" which impinged upon the Indian coast as the result of the shock and the sub-oceanic displacement cost the lives of between 40,000 and 50,000 people. The volcano of Coseguina or Conseguina, in Nicaragua, which stands near the outlet of the Bay of Fonseca, about sixty miles distant from the line of the initially proposed canal, and about 150 miles from that of the canal now proposed, went through a paroxysm similar to that of Krakatoa in 1835. It is impossible at this late day to ascertain the full measure of disturbance which this outbreak occasioned, but there can be no doubt that it was considerable. Prof. Eduard Suess, of Vienna, thus describes the cataclysm in his monumental work—'Das Antlitz der Erde' (1885):

> The eruption of January 20, 1835, can, perhaps, properly be regarded as the most stupendous and frightful of this class of phenomena that has taken place for centuries. So prodigious was the mass of material ejected from the earth's interior that Dollfuss and Montserrat estimated the distributed parts to have covered the oceanic surface over an east and west extent of 1,200 miles. . . . The disturbances to the crust were transmitted with terrifying force northwestward through Guatemala to Chiapas, northeastward to the island of Jamaica, and southeastward to Bogota. (Translation.)

Mr. C. Willard Hayes, of the United States Geological Survey, who, in an official capacity, recently examined the region of the proposed canal, in a paper on the "Physiography of the Nicaragua Canal Route" incidentally refers to the explosion of Coseguina as "the most violent recorded eruption until surpassed by that of Krakatoa in 1883." The history of this volcano alone, a mountain of only Vesuvian proportions, but with a record comprising at least three violent eruptions, ought to have been sufficient to ward off Squier's reply to Prof. Silliman "that on the line in question there was every reason to believe the volcanic force had pretty completely exhausted itself many ages ago."

On the 11th, 12th, and 13th of April, 1849, Mr. Squier was himself witness to the formation of a new volcano on the plain of Leon, at a position only a few miles removed from the course of the then contemplated canal, of which he was an uncompromising advocate; and on the 14th of November, 1867, a second volcano was reared up in close proximity to the first, standing on a fissure between the volcanoes of Pilas and Orota. The Hon. A. B. Dickerson, at the time United States Minister to Nicaragua, in describing this volcanic creation, states that "in a few days two craters were opened on the new fissure," and that "the explosions opened a fissure through the earth's crust about half a mile in length." The volcano of Conchagua, which faces Coseguina from the northern side of the Bay of Fonseca, and was thought by Alexander von Humboldt in 1853—at the time of the preparation of the final volume of his "Cosmos"—to be extinct, again broke out into eruption on the 23d of February, 1868. Izalco, in Salvador, which broke into existence in 1793, has been in continuous activity for over a century, markedly contrasting in its life-history with the volcano of Lake Ilopango, which came into being in 1880, and has since almost entirely disappeared.

On the line of crustal weakness which is occupied by Lakes Nicaragua and Managua, and whose centre it is proposed to pierce by the new Nicaragua Canal, there are distributed at fairly equal distances, and over a linear distance of little more than 200 miles, not less than twenty-five volcanoes, most of which have been active within a very moderate period of time, while a number are active today; some, again, have been in operation so recently that they might properly be classed with the active cones. Several of these are situated within the confines of Lake Nicaragua itself (Madera, Ometepe, Zapatera), and others, as Mombacho, Momotombito, Mom-

otombo, are placed in close proximity to its waters or to those of the adjacent Lake Managua. Indeed, the investigations of Mr. Willard Hayes indicate that the entire existence of Lake Nicaragua has primarily been the result of the volcanic activities of the region, the strip of land that separates it from the Pacific, and now holds it in its present position, being largely an accumulation of ejected volcanic material, most of it very recent, which has been raised to different positions by land movements or displacements. Formerly the position of the lake was that of a bay of the ocean. Where land and water transformations of this kind have been taking place in a recent past, and as the result of the operation of the identical forces which are at work in the region to-day, it is hardly necessary to emphasize the possibilities that belong to the future. It is interesting to note in this connection, and as bearing upon a probable or possible formation of new land to the westward of the present Pacific Coast of Nicaragua, that the observations of Humboldt, Seebach, Dollfuss, and Suess clearly show that there is a steady transference of the centres of activity, along the well-defined fissural lines, from the east to the west.

It is hardly necessary in this place to direct attention to the series of very active volcanoes which are removed somewhat further (although not remotely so) from the particular region which centres about the prospective canal. The following quotation from the writings of Humboldt, bearing upon the Volcan de Fuego of the Guatemalan plain, may not, however, be without its application: "The older great eruptions were those of 1581, 1586, 1623, 1705, 1710, 1717, 1732, 1737, and 1799, but it was not only these eruptions, but also the destructive earthquakes which accompanied them, that moved the Spanish government in the second half of the last century to quit the second seat of the city (where the ruins of La Antigua Guatemala now stand) and compel the inhabitants to settle further to the north in the new city of Santiago de Guatemala." The earthquake of 1773, which led to the abandonment of the city of Old Guatemala, is stated by Squier not to have been as violent as many others that have happened since, notably those of 1830 in Guatemala and of 1841 in Costa Rica. The latter nearly destroyed the city of Cartago, "which had previously suffered a similar catastrophe. May, 1844, was distinguished throughout Nicaragua by a series of earthquakes occurring at regular intervals over a period of several days. The city of Nicaragua suffered much, and the waters

SUMMIT OF IRAZÚ, COSTA RICA.

and more pertinently so in the possibilities of future volcanoes to which a region of this kind is prone to give birth.

Summarizing his results on earthquake disturbances in Nicaragua and the adjoinining states, Major Dutton states his opinion "that the risk of serious injury by earthquakes to the constructions proposed for the Pacific section of the canal is so small that it ought to be neglected alike by the Maritime Canal Company, the Construction Company, and by contemplating investors," It is probably on the strength of this opinion that the Nicaragua Canal Construction Company, in their brochure on "The Inter-Oceanic Canal of Nicaragua"(1891), refer to the "grand old" cathedral of Leon as having "for more than a century and a half . . . stood the vicissitudes of earthquake, weather, war, piracy, revolution, and its walls are still solid and unshaken," and define the risk of injury to Nicaragua canal constructions by earthquakes as existing only "in the theories of those who are interested in the making of a canal at some other locality, or in the mind of the man who is naturally a pessimist and opposed to all bold undertakings." Had the authors of these statements been able to foresee the events of the next decade they would, doubtless, have modified them to an extent. On April 29, 1898, a violent earthquake, having its greatest intensity in the plain of Leon, agitated the whole of Nicaragua, and was with greater or less force felt throughout much of Salvador, Honduras and Costa Rica. In the city of Leon itself, as reported by the Government Technical Commission, no less than 340 houses were considerably damaged, and the famous cathedral had its walls and cupolas, even if only lightly, rent with cracks. The church of St. Sebastian was completely wrecked. In Chinandega sixty houses were almost completley destroyed or reduced to that condition of insecurity that they had to be torn down. Much damage was inflicted by the earthquake even on solid stone constructions.

Towards minimizing the possible effects of seismic disturbances Major Dutton correlates these phenomena with the activities of the volcanoes, and expresses the belief that the principal earthquakes, and, "perhaps we may say all the forcible ones, have had their centre in close proximity to the volcanoes or underneath them, and are incidents apparently of the volcanic activity. There is no evidence nor any suggestion, so far as I can ascertain, that any of them have originated at a considerable distance from the volcanoes." Dr. Carl Sapper, who during a number of years has made

a special study of the Central American volcanoes, and has had the opportunity to make a personal examination of the region of last disturbance, arrives at a conclusion precisely the reverse of that expressed by Mr. Dutton. He finds, after a careful study of the surrounding volcanoes, that none gives indication of having originated or been directly associated with the seismic disturbance of April, 1898, which is regarded as a purely tectonic one, developed through rock dislocation in an area of special crustal weakness. And he significantly remarks that "in such a sunken trough (as that occupied by the depression of the lakes), which only acquired its features in a geologically recent period, tectonic dislocations can be expected with certainty" (translated from *Globus*, April 8, 1899).

It can hardly be said that the conclusions arrived at by Mr. C. Willard Hayes, United States geologist of the Nicaragua Canal Commission of 1897-99, which, while not based upon any special study of the earthquake or volcanic phenomena of the region, are wholly confirmatory of those expressed by Major Dutton, are more convincing than those of his predecessor in the field. Mr. Hayes closely associates the earthquake phenomena of the region with its volcanic activities, and assumes the simultaneous decadence of the two classes of phenomena. The well known facts of volcanic regions, apart from the history of the special region itself, give, however, scant countenance to the supposition that the volcanic vents of the Costa Rican-Nicaraguan Ranges "belong almost entirely to the solfataric stage, which characterizes the extinction of volcanic activity." With equal truth could one designate the rest periods of Vesuvius and Ætna, or of Colima, in Mexico, as representing a solfatara stage. Nor do the known facts regarding volcanoes permit of the acceptance of the view that because a "great mass of material . . . has been extruded from these vents in comparatively recent geological times, it is very clear that the activity in the region is on the wane." The history of every large volcano, with its superposed beds of lava, etc., representing different periods of eruption, is a clear contradiction of this assumption; and the late events in the Sandwich Islands are eloquent and convincing testimony to the contrary. As well could the statement regarding the somnolence of the Nicaraguan volcanoes have been made immediately prior to the catastrophe of Coseguina as to-day. Indeed, the records of the fifty years preceding the Coseguina eruption, if in their imperfection they indicate anything at all, plainly tend to prove

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It can hardly be said that the conclusions arrived at by Mr. C. Willard Hayes, United States geologist of the Nicaragua Canal Commission of 1897-99, which, while not based upon any special study of the earthquake or volcanic phenomena of the region, are wholly confirmatory of those expressed by Major Dutton, are more convincing than those of his predecessor in the field. Mr. Hayes closely associates the earthquake phenomena of the region with its volcanic activities, and assumes the simultaneous decadence of the two classes of phenomena. The well known facts of volcanic regions, apart from the history of the special region itself, give, however, scant countenance to the supposition that the volcanic vents of the Costa Rican-Nicaraguan Ranges "belong almost entirely to the solfataric stage, which characterizes the extinction of volcanic activity." With equal truth could one designate the rest periods of Vesuvius and Ætna, or of Colima, in Mexico, as representing a solfatara stage. Nor do the known facts regarding volcanoes permit of the acceptance of the view that because a "great mass of material . . . has been extruded from these vents in comparatively recent geological times, it is very clear that the activity in the region is on the wane." The history of every large volcano, with its superposed beds of lava, etc., representing different periods of eruption, is a clear contradiction of this assumption; and the late events in the Sandwich Islands are eloquent and convincing testimony to the contrary. As well could the statement regarding the somnolence of the Nicaraguan volcanoes have been made immediately prior to the catastrophe of Coseguina as to-day. Indeed, the records of the fifty years preceding the Coseguina eruption, if in their imperfection they indicate anything at all, plainly tend to prove

that there has latterly been an increase, rather than a decrease, in the intensity of the volcanic action, and perhaps even the region affected by it has enlarged rather than diminished. Mr. Hayes himself cautiously admits with regard to the volcano of Ometepe, in which he recognizes one source of danger to the western division of the canal, * that while "no eruption appears imminent, there is no certainty that its activity has entirely ceased." This volcano had been regarded as being entirely extinct prior to the eruption of 1883. Up to 1886 the volcano of Tarawera, in New Zealand, which dominated the landscape of the enchanting "pink" and "white" terraces—frequently referred to as one of the wonders of the world—was thought to be entirely extinct; but in June of that year the pent up volcanic force broke out with terrific energy, and rent the earth with a chasm miles in length. Lake Rotomahana was drained of its waters, and its bottom lowered over 200 feet.

Mr. Hayes, while adopting in a general way Major Dutton's views as to the absolute inter-relationship of earthquake and volcanic phenomena in the Nicaraguan-Costa Rican region, a view that is not shared by the Technical Commission which was appointed by the Nicaraguan government to report upon the earthquake of 1898, admits the probability that the earthquake in question may have been the result of rock-faulting (dislocation), and even significantly suggests that the "present earthquake may be due to a further displacement along one of these old lines of fracture or to the inauguration of a new fracture" (p. 136). With this admission and the further statement that the "region to the north of Lake Nicaragua has been affected by faults in comparatively recent times," a geologist need hardly assent to the proposition, otherwise entirely unsupported by the facts of geology, that earthquakes "due to dislocations of the strata are perhaps no more liable to occur in the vicinity of the Nicaraguan Canal than elsewhere," and hence constitute no "danger which is peculiar to this region more than to almost any other in which a ship-canal might be constructed."

Of the types of volcanic earthquakes, or such at least they are assumed to be, Prof. Henri Pittier, of the Physico-Geographical Institute of Costa Rica, enumerates twelve "great" ones as having visited Costa Rica in the interval between 1722 and 1865, most of them seemingly having been associated with the activities of the vol-

* Geological Report of the Nicaraguan Canal Commission, 1899, p 137.

ONE OF THE CRATERS OF POAS, COSTA RICA.

canoes Poas and Irazú. In 1803 the town of Cartago was considerably damaged; in 1841, in the midst of a very protracted period of seismic activity, it was completely destroyed, and ten years later (1851), it again met with the same fate. Considerable damage was once more inflicted upon it in 1854, as well as upon San José, which had previously suffered in 1841. While it may be true that the regions affected by these disturbances were in most instances restricted to a comparatively narrow epicentral divergence, yet it is equally true that the disturbances of 1835 at Coseguina and of 1847 at Irazú—at the opposite ends of the line that is to be traversed by the canal—were violently felt throughout almost the entire extent of the land, from Nicaragua to Costa Rica in the one instance, and from Costa Rica to Nicaragua in the other. It has sometimes been assumed that the activity of Irazú ceased with the violent eruption of 1726; but the official documents cited by Prof. Pittier show that the volcano was unusually active in May, 1822, and again on May 18, 1847. A very light eruption also took place in the latter part of 1888.

II.

AN ASSUMED INCONSTANCY IN THE LEVEL OF LAKE NICARAGUA.

A source of doubt which attaches to the Nicaragua Canal and involves the question of permanency is furnished by the level of Lake Nicaragua—the fountainhead of the San Juan River, and the summit and feeder of the proposed canal. The regulation of its level is necessarily a matter of absolute or vital importance to the canal. The very elaborate measurements of American engineers that have been made during the last fifteen years indicate for the surface of the lake an average elevation at this time of approximately 105 feet above tide.* The earlier determinations of Lieut. Baily, made from 351 levels, and with what had generally been assumed to be sufficient accuracy, placed the surface in 1838 at 128 feet 3 inches above low water at San Juan del Sur, on the Pacific side; while in 1781 the Spanish engineer Galisteo made the altitude still 5 feet higher (or,

* See the reports of Chief Engineer Menocal, of the Maritime Canal Company, and of the Nicaragua Canal Board. Col. Childs, in 1851, determined the ordinary high water to be 102 feet 10 inches above Pacific high tide, and 111 feet 5 inches above low tide.

more exactly, 133.11 feet).* It is difficult to understand these discrepancies in values or to assume that competent engineers should have erred over such short distances of measurement to the extent of twenty per cent. of their results; yet the concurrence of the newer results of measurement leaves no room for doubt that either Baily's and Galisteo's determinations were faulty or there has actually been an abasement of the lake-level since these measurements were made. The measurements of Lieut. Baily have been particularly commended in the earlier discussions of the canal problem, and in the historical summary of the canal project published by the Nicaragua Canal Construction Company in 1891, it is stated that "he was thoroughly competent and well equipped for the undertaking [the survey of the canal route]." He himself states that his levels were run with great care and attention by a good theodolite during a period of four months.†

It is a little surprising that in their discussions of the possibility of maintaining a general level for the lake, neither the Nicaragua Canal Board nor the Nicaragua Canal Commission of 1897-99 makes particular reference to this earlier determination of altitude; nor does the survey of Chief Engineer Menocal take count of it. Manifestly its wide divergence from the results obtained by the newer surveys has given to it the stamp of inaccuracy, but this has perhaps not yet been proven to be the case, and it is by no means certain that the differences in values between the higher and lower elevations that have been found in recent years, with a tendency toward the lower plane, may not in part be the expression of an actual abasement of the surface, and not merely a fluctuation dependent upon the hygrometric condition of the atmosphere.‡ Some evidence for considering an actual lowering of the level of Lake Nicaragua is found in the condition of its northwestern termination—the so-called Estero Panaloya. At the time of the Baily survey, and eleven years later (in 1849), when Squier passed over the region and drew his plan of

* Galisteo's measurement was obtained from 347 levels, of about a hundred yards distance, starting from the Gulf of Papagayo, on the Pacific Coast. The Spanish MS. referring to this determination was formerly deposited with the archives of Guatemala, and was copied by Mr. Thompson before 1825.

† Fitz-Roy corrects Baily's measurement to 125 feet 6 inches—"mean elevation of the lake above mean height of Pacific Ocean."

‡ Col. Ludlow, in his testimony given before the House Committee of Interstate and Foreign Commerce, gives a lowest stage of the water of 96.6 feet. At other times it has stood at 98.6, and on May 2, 1872, 100.97 feet. In 1873, as determined by Commander Lull, the surface-level was 102.28 feet. The extreme range within a few years has therefore been 14 feet. There is seemingly a tendency to hold to the lower levels.

the Managua-Nicaragua Canal, the Estero was open to free navigation (with water of 5 to 15 feet depth) and to the extent that Squier represented the two lakes as being separated by only four miles. Colonel Ludlow in his report states that the course of the Tipitapa (Panaloya) River between the two lakes is 23 miles, and that in the dry season, at least, the channel of the river is also dry, whatever water finds its way into it from the smaller lake disappearing through fissures in the bed.

The extent of the recent fluctuations of the lake-level is, indeed, such as to have caused some of the well authenticated data that have been obtained by the different commissions to be accepted by them with both surprise and incredulity. Colonel Childs assumed the absolute fluctuation of level to be measured by not more than 5 feet, or little less than what was subsequently reported by Chief Engineer Menocal. The researches of the Nicaragua Canal Board of 1895 extended the range of variation to about 14 feet—from 96.6 to 110–111 feet. In the report of the Nicaragua Canal Commission reference is made to a reported variation between 97 feet and 112 feet, but the "reports of traditions" of such variation are said to be uncertain. It is admitted, however, to be "reasonably certain that it fluctuates between 100 and 110 feet above sea level, at not distant intervals."

Chief Engineer Menocal discredits the report, furnished by the Nicaragua Canal Board, of the lake ever having fallen to 96.6 feet, as "such low lake would practically cut off the flow of the San Juan below Toro Rapids, an event not recorded in the history of the country."*

Such an extreme low stage of the river, however, appears to have existed at the time that it was surveyed by the English engineer Collinson, who, in his report to the Royal Geographical Society (1867), states that the water was so low that small stern-wheelers, drawing when laden only ten inches of water, could hardly grope their way from rapid to rapid, and were finally stalled by the swift, bowlder-charged current. And yet this was the stream that Squier in 1850 compared with the Hudson and the Connecticut, and which

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* Testimony before the Committee of Interstate and Foreign Commerce, Senate Document 315, p. 69. Mr. Menocal, in his various reports, does not appear to have confined himself to a strict unit of measurement for tide surface of the lake. In his report addressed to the Directors of the Nicaragua Canal Construction Company, January 31, 1889, it is stated that the elevation of the lake at the time the surveys were made was 102.5 feet; elsewhere its "elevation above the mean sea level is taken at its mean as 110 feet."

ILOPANGO IN ERUPTION IN 1880, SALVADOR

he said was for "far the greater part of its length capable of being navigated by our largest river steamers."

It has been customary to regard the surface fluctuations of the lake as being periodic or recurrent, depending upon the seasonal changes of one or more years. But might it not equally well be assumed that, apart from the minor periodic fluctuations, there is a distinct oscillation of level, tending to a possible permanent lowering of the surface, which is dependent upon conditions largely distinct from those which are associated with the seasonal rainfall? And is it not after all likely that the high levels given by Galisteo and Baily were correct for their times? In his communication to the Royal Geographical Society already referred to, Engineer Collinson gives emphatic testimony to the lowering of the level of the lake, and suggests—what is not unlikely to prove the true explanation of the phenomenon—that it may be due to increased potentiality of the outgoing or draining waters incident to a differential rise of the land surface. He says: "Every year it becomes more evident to all living on its banks or using its stream that the flow of water is becoming less in the San Juan; and even the least observant native, dwelling on the lake, will tell how its banks are rising year by year visibly before his eyes, how the River Panaloya connecting the two great lakes is becoming drier every season, so much so that at times lately no water connection has existed between them. Noting the fact that these lakes are in the middle of the great volcanic range bisecting the Isthmus, which dies out to nothing before reaching the low alluvial shores of the Atlantic, may it not be conjectured that the gradual upheaval of the centre, while the coast has remained almost unmoved, should year by year increase the gradients of the river, and by creating a more rapid flow of water cause the perceptible drainage of the lakes and lower the level of their waters? Also, will this not help to account for the formation of the deltas and silting up of the estuary of the San Juan?" At this time it would appear by no means unlikely that a pronounced shrinkage of the lake, brought about in the manner indicated by Collinson did in fact take place, and it would hardly be surprising if it should be determined that a considerable dropping of the surface was effected in the period of a very few years. Indeed, the Childs survey, if we assume correctness in his and Lieutenant Baily's measurements, makes it almost indisputable that this must have been the case, for in 1850 the level of the lake had already been found

ILOPANGO IN ERUPTION IN 1880. SALVADOR.

reduced to 103.7 (low stage) feet.* The Baily survey was made in the interval of time between the catastrophic eruption of Coseguina (1835), on the northwest, and the very violent one of Irazú (1841) on the southeast, and it was also about this period of special excitability of the crust that, as Squier reports, Nicaragua suffered most from earthquake visitations. It was in May, 1844, when the city of Nicaragua itself suffered much, that the waters of the lake "were observed to rise and fall with the throes of the earth." Naturally, it is to a period of this kind that one would look for the most rapid or permanent terrane displacements.

The subject of the oscillation of lake-levels has only during the last 20 or 25 years attracted the serious attention of geographers, and only in the case of a very few lakes is the information pertaining to them of such a precise nature as to permit of definite conclusions being drawn regarding their condition. This much is known, however, that a number of lakes have undergone marked changes in volume, whether toward an increase or a decrease, in comparatively short periods of time; others have gained or lost through slow but steady accretions or diminutions extending through a considerable number of years. In some instances the oscillations can be referred to well known causes; for others, an acceptable explanation is still to be found and given. A few instances of marked oscillation, which may have a bearing upon the condition and question of permanency of Lake Nicaragua, are here given.

LAKE GENEVA.—The height of this lake above the level of the Atlantic is, according to the more recent measurements, 1,218.8 feet. On the old Carte Fédérale Suisse it appears with 375.03 meters or 1,229 feet, an excess of 10.2 feet over the newer determinations. During the past century, according to the researches of Prof. F. A. Forel, the surface oscillation between the highest (July 16, 1817) and lowest (Feb. 4, 1830) levels was 8.7 feet.

GREAT SALT LAKE.—The noted fluctuation of this lake is compassed within 11 to 13 feet. On Stansbury's map of 1850 it is represented as covering an area of 1,750 square miles and having a maximum depth of 36 feet. The newer survey (1869) of Clarence King placed the area covered by it at 2,170 square miles, and its maximum depth at 49 feet.

LAKE BALKHASH, in the Russian province of Semipalatinsk,

* On September 19, 1850, it was 105.62 feet.

Siberia.—The waters of this lake, which may be said to belong to the Aralo-Caspian tract of desiccation, are undergoing a remarkable abasement. According to the investigations of Nikolski, as communicated by M. Venjukow to the Academy of Sciences of Paris (*Comptes Rendus*, 1886, p. 1045), the present lowering of the surface is effected at the rate of about one metre in every fifteen years. The area of the lake covers about 7,800 sq. miles.

LAKE VAN, in Armenia.—This lake, as the researches of Jaubert, Loftus and Strecker plainly show, has been subject to successive partial and negative oscillations of level, but for the better part of three quarters of a century—contrary to what is taking place in the case of most of the Asiatic lakes—its waters have been steadily rising. Between 1838 and 1840 the level is assumed to have risen 10–12 feet.

LAKE BAIKAL, Siberia.—The perfectly fresh shingle strands which stand above the surface at a height of 20–22 feet would seem to indicate that this lake, probably the largest in volume of all the fresh water lakes of the earth, has undergone a quite recent lowering by this amount. The lack of observations unfortunately does not permit of the determination of just when this latest abasement took place.

LAKE TEXCOCO, on the plain of the City of Mexico.—The ancient city of Tenochtitlan (the modern Mexico) was at the time of the Spanish conquest completely surrounded by this pan of water, on a number of islands in which it was constructed. At this time the waters have withdrawn eastward, and approach the city to within a distance of two miles. At the time of Humboldt's visit, in 1804, the lake was reported to have a general depth of from 10 to 16 feet, but now the greatest depth is only about 5–6 feet, and ordinarily the depth does not exceed 1½–2 feet. A portion of this diminution is doubtless due to the withdrawing from the lake of the overcharge of Lakes San Cristobal, Xaltocan and Zumpango.

LAKE OKEECHOBEE, Florida.—All the evidence in the region of this lake and of the Caloosahatchie near to and some distance from Lake Hikpochee indicates marked oscillations, with a tendency toward permanent abasement of the lake surface. Unfortunately, no scientific observations prior to 1885 have been made in this interesting region, and consequently no absolute statement of its conditions can be made.

NEUSIEDLER SEE, (or Fertö Tava) of Hungary.—According

to the investigations of Béla Széchényi, this lake began slowly to empty itself in 1854, and became quite dry in 1868. In 1869 the waters again began to accumulate, and by 1879 had once more reached full high-water mark. A protracted period of increase was noted in the years 1744–55. Subterranean channels of inflow and outflow have been suggested to account for these remarkable fluctuations, but they have not yet been determined to exist.

LAKE TANGANYIKA (East Central Africa).—The marked increase in the volume of this lake was noted by both Thompson and Stanley. The latter asserts, from soundings made by himself and the testimony of reliable natives, that within a period of some thirty years preceding 1876 the surface of the lake had risen fully 18 to 20 feet.

LAKE ILOPANGO in Salvador, Central America.—The most remarkable changes in level recorded in the case of any lake are those which were made known by Profs. Ortega and Rockstroh, representing an official Guatemalan Commission, in the course of their investigations into the eruption of the volcano of Lake Ilopango in 1879–80. It was then observed that between December 31 and January 11 the surface of the lake had risen just four feet. Through the increase in volume of 66,000,000 cubic meters the lake changed its moderate drain into a broad and tumultuous torrent, which in a short time so rapidly degraded its channel as to cause a sudden subsidence of the lake. A lowering of the surface began on January 12, and within three hours the waters had subsided 8.3 feet. On February 11 the surface had been reduced to 30 feet below the highest stage, and on March 6 it was still further lowered by 3.5 feet. In a period of less than two months, therefore, the surface had fallen 33.5 feet, and the lake lost in volume, as estimated, 635,000,000 cubic meters. This extraordinary lake measures approximately 5.5 miles in length and 4.3 miles in width. In the middle of the 18th century it occupied a considerably lower level than it does to-day, and seemingly the surface was raised by damming of the outflowing waters. In 1873 it passed through a disturbance similar to that of 1879–80, but of less degree.

It will thus be observed that the fall of Ilopango considerably exceeds that which is indicated for Lake Nicaragua in the difference between the measurements of Baily and Childs (or Menocal), and this fact becomes of special interest when it is recalled that both lakes are hardly less than close neighbors of one another, and that their phe-

nomena are largely associated with the phenomena of vulcanism of one and the same region. Unfortunately we possess no extended history of lake Nicaragua, and seemingly the only precise geographical data that are extant regarding it, and which antedate the Childs survey, are just those that are contained in the reports of the authorities whose measurments differ so largely from the ones of more recent date. Hence, they can give evidence neither for nor against accuracy.

This lack of comparative knowledge of the physics of the lake and river region of Nicaragua in its bearing upon the construction of a canal has been properly emphasized by the Nicaragua Canal Board in their report of 1895, and its existence is also fully appreciated by Mr. Menocal. In a review of the engineer's report he significantly says : "In a country like Central America, where the range of rainfall in the same locality varies as much as 100 inches from one year to another, and 200 inches or more in the same year between points less than 100 miles apart, theories based upon observations extending over twenty years may be entirely upset the twenty-first." Hence, in conclusion, it may not be safe to assume that the earlier measurements of the lake were erroneous, and rather would one believe that :

1. The level of Lake Nicaragua is inconstant.

2. The surface had dropped 15 to 20 feet in the period of little more than half a century.

Whatever may be the exact condition of Lake Nicaragua at the present time, or the extent of its past oscillations, it is certain to undergo further change when it will have lost its chief tributary, the Rio Frio—a stage which seemingly cannot be very far removed. This stream rises on the Caribbean slope of the Costa Rican mountains, within or on the border tract of excessive precipitation, and discharges its water in the southeastern extremity of the lake not far from the discharge of the San Juan. The great quantity of sediment that is thrown into this section of the lake has shallowed it very materially, and numerous banks and isles (as about the Solentiname Archipelago) already rise above the water. When once fully blocked in, the course of the Rio Frio will necessarily be deflected to the San Juan—withdrawing its waters from the lake and adding its sediment to the San Juan. The danger from this condition to the canalization of the San Juan, has, indeed, been pointed out by more than one geographer, and Élisée Reclus properly remarks that this

CHURCH OF SAN ANTONIO, CHINANDEGA, AFTER EARTHQUAKE OF APRIL, 1898

STREET IN CHINANDEGA AFTER EARTHQUAKE OF APRIL 29, 1898.

stream, thus charged with sediment, may "form a chief obstacle to the proposed inter-oceanic canal".* The surplussage of sediment in the Colorado arm of the San Juan, as an obstacle to the canalization of this branch of the river, had already been recognized by Squier forty years ago. Briefly, then, the conditions of the lake and the Rio Frio are such as to permit us to assume 1, a further and increased abasement of the level of the lake; and 2, increased sedimentation in the discharge of that lake, with direct accessions to the volume of the San Juan. Both conditions, it is almost needless to say, are opposed to any continued stability or permanency of a canal.

III.

THE DEFORMATION OF THE NICARAGUA COAST-LINE.

The question of permanency of the proposed Nicaragua Canal is also closely bound in with the degree of stability of the two shore-lines which are to be the terminals on the Atlantic and Pacific sides. The deformation of the Atlantic shore-line through deposit of sediment, both oceanic and fluviatile, is of such rapid progress as to have uncompromisingly led many engineers to the conviction that no harbor could for any very long period be kept open at the proposed point of entry of the canal, or even at positions fairly remote from it. This difficulty has, indeed, been properly appreciated and accentuated by some of the more prominent members of the Nicaragua Canal Boards, but their recommendation to shift the approach away from Greytown seems to have met with but little support. while their warnings have practically counted for naught.† The subject, dealing as it does principally with engineering problems, hardly comes within the province of the geologist or geographer; yet it may be

*The Earth.—North America, II, p. 279 It is interesting to recall in this connection, and as marking the potentiality of mountain streams, that the Ticino, the principal affluent of the Lago Maggiore, in Northern Italy, whose average discharge just before entering the lake is 8,700 cubic feet per second, at times of heavy rains has been found to pour out a volume of 150,000 and even 200,000 cubic feet. The stream is then twice as powerful as the Rhone at the forks of Arches, and almost equal to the average Nile. With similar accessions from the Verzasca and Maggia, the lake is known to rise seasonally 20—23 feet, and to increase its extent by one-fifth. On the other hand, the discharge of sediment is such as to cause a rapid silting of the upper portion of the lake, or that portion known as the Bay of Locarno.

† See the Report of the Nicaragua Canal Board, October 31, 1895—House of Representatives. Document 279. Also the testimony of Engineers Ludlow and Endicott before the Committee of Interstate and Foreign Commerce, 1896.

of interest or even of importance to read the statements of earlier investigators who were in no way interested in the American enterprise. Commander Bedford Pim, of the Royal Navy, wrote in 1862 as follows: "In April, 1860, I made a most careful survey of the port (Greytown), and, after reducing my work to the same scale as the Admiralty chart, constructed some years previously, I placed my own plan in red ink upon it, and the result was most startling. Indeed, I consider the rapid filling up of Greytown Harbour the most curious instance of the kind I have ever heard of." Where two years before the frigate "Eurydice," drawing four fathoms (24 feet) of water, sailed out of port without the least inconvenience, a greatest depth of only 11 feet could now (1860) be found.

Commander Peacock, R. N., who commanded the first steamship that ever visited Panama (February, 1842), and surveyed the coast of Nicaragua as far back as 1831—discovering the singular cartographical misplacement of this coast by 58 miles of longitude—in a communication to the Royal Geographical Society of London, in November, 1867, describes the hydrographical changes taking place about the mouth of the San Juan as "one of the most remarkable changes, by natural causes, known; for what was a good harbor from 1831 to 1857, with anchorage for a fleet of large ships, having deep water on both sides of this natural dyke, became converted into a lagoon in 1859, by the spit joining the mainland—soon after which the harbor was shut up." The spit referred to is Punta or Point Arenas, whose extraordinary growth of 1½ miles in length in less than 30 years is certainly one of the most imposing lessons which the dynamics of the earth's surface teach.

It is not merely at or near the mouth of the San Juan, whose upper waters it is contemplated to use for canal purposes, that these coast changes are taking place. They take in, as a matter of fact, almost the entire Nicaraguan Coast, for Bluefields, Pearl Bay, and Cape Gracias Lagoon were at one time capacious harbors, instead of silted lagoons as they are in the main to-day; and when Lord Nelson was in Cape Gracias Lagoon in the latter part of the last century, it appears to have been a harbor superior to Greytown. Mr. John M. Nicol, C. E., who made an examination of the east coast in the early part of 1898, reports of the last-named as follows: "One hundred years ago it was a fine harbor, but it is silting up so rapidly that it will soon be nothing but a swamp."* It is in rela-

* Geographical Journal, London, June, 1898.

tion to phenomena of this kind that Capt. (afterwards Admiral) Fitz-Roy, in discussing the projected transoceanic routes, properly remarks: "It is common to underestimate the power of natural forces, when not immediately or visibly in operation. The swell of the ocean, the tornado, the torrent and inundation, and the wide-spreading effects of volcanic eruptions, are almost unheeded at a distance." The criticisms of Fitz-Roy appear amply justified in the light of the conditions which have prevailed in the region under consideration, and so largely negatived the special work of construction looking to the deepening of the San Juan River and the harbor of Greytown. The great sea-dam of more than 900 feet length, constructed with the view to ward off the inflowing sands, has proved ineffectual—incapable, except for a brief period to stem the sediment which is being pushed along the coast, and whose apparently unconquerable force had already been recognized by English surveyors and engineers—Fitz-Roy, Peacock, Pim, Collinson—thirty and forty years ago.* In this connection Mr. W. Henry Hunter, Chief Engineer of the Manchester Ship Canal, writing in 1899 (*Engineering Magazine*), says: "The policy which fights against the forces of nature is a mistaken one; it is fore-doomed to failure. Nature may be aided in her operations; her more gigantic forces may to some extent be curbed, not controlled; but an almost certain Nemesis pursues any effort which may be made to avert and to determine in an absolute way a process so continuous as that of the filling up of the Greytown bight."

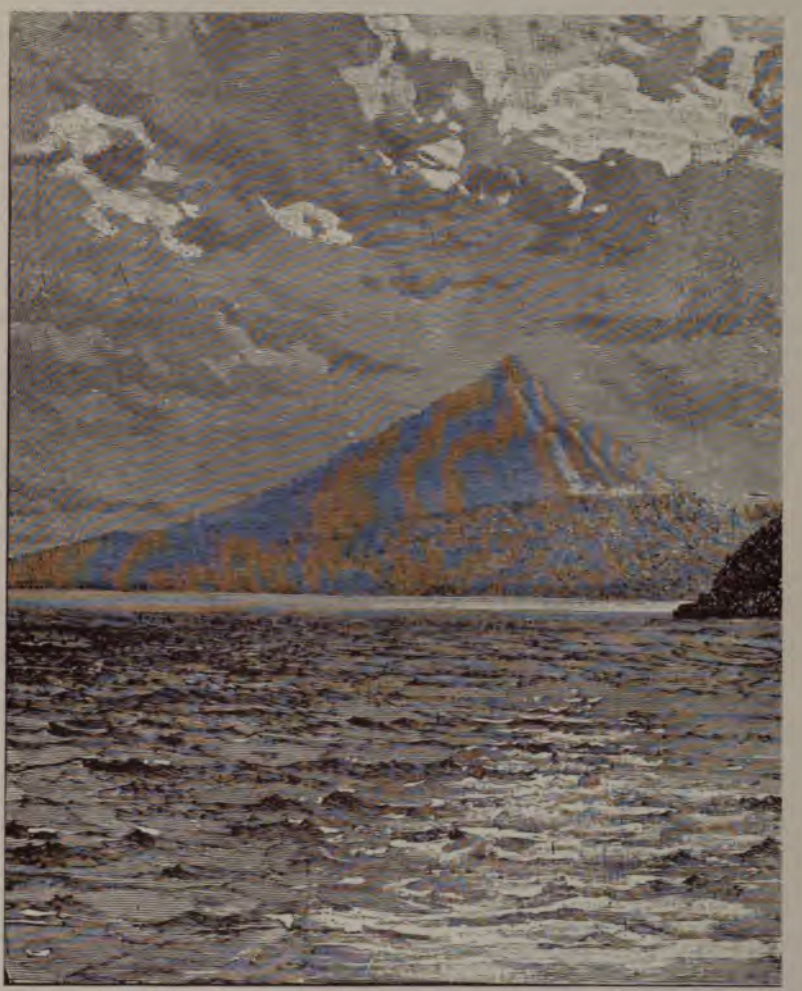
The utilization of one of the more southerly arms of the San Juan, as the Colorado, or of some more distantly placed "open" harbor, as an approach to the canal has been suggested by at least one of the boards of inquiry, but it is questionable if any of the sites indicated would have any advantage over Greytown. The geographical construction of the region makes it almost certain that no open area, or one that is likely to remain open for any great length of time, exists. The Colorado arm of the San Juan is essentially the sedimenting outlet of that stream, and it itself lies within an area of shifting ocean sands; this fact virtually disposes of this stream as an available avenue of entrance to the canal. Without attaching undue importance to his statements in this connection, it may not be amiss

* See also the report of the special commission of the National Academy of Sciences of 1866, and the reference to it by Engineer Endicott in his testimony before the Committee on Interstate and Foreign Commerce.

to quote the earlier opinion of Mr. Squier: "It is not supposed that, under any practicable system of improvements, this (the Colorado) mouth could be used for commercial purposes, or as a means of entering the river."

As regards the configuration of the Pacific coast in the region of the proposed outlet to the canal our knowledge is very deficient. The positive data at hand hardly permit us to estimate the changes that have taken place during a comparatively recent period of time. There is, indeed, hardly any authoritative account of this coast, permitting of a comparison of conditions formerly existing with those existing at the present time, which dates further back than forty or fifty years; and the closely confined surveys of the modern canal commissions present nothing in this relation. About the only authority who has collected data bearing upon possible land displacements or deformations in this section of the American coast is Alexander von Humboldt; and his views, based upon a critical examination and comparison of early maps and publications, would lead entirely to the supposition that changes of a marked character had visited the coastal region, and within a moderately recent period. In his *Essai Politique sur le Royaume de la Nouvelle Espagne* (1808), he states that the earlier Spanish maps indicate a direct water connection between Lake Leon (Nicaragua) and the Pacific, and that later ones even give a river, the Partido, one of whose branches is represented as flowing into the Pacific and the other into the lake. Such a map is that of Thomas Lopez and Juan de la Cruz, published in 1755, and reproduced in Bastide's Memoir on the transoceanic passage published in 1791. Naturally, all allowance must be made for inaccuracies and fanciful representations contained in the earlier geographical publications, whether books or maps, and it may be that Humboldt's reference has no particular significance.* Yet it must be recollected that that savant was most critical in the use of his authorities, and would hardly call attention to data which he thought unworthy of consideration. The geological construction of the strip of land which to-day separates Lake Nicaragua from the Pacific, as is shown by the examinations of Seebach, Dutton, Sapper and Willard Hayes, places beyond doubt the fact that relative displacements between the land surface

*Mr. John Milne, in a suggestive paper on sub-oceanic changes as indicated by cable fractures and interruptions, calls attention to such interruptions having taken place on the coast between Panama and San Juan del Sur on June 4 and July 31, 1889. (London Geographical Journal, September, 1897.



LAKE NICARAGUA AND THE VOLCANO MOMBACHO.

and the ocean have taken place within at least a very modern geological period; and it is by no means certain that some of this deformation does not absolutely belong to the present time. The coast line of Guatemala has undergone quite extensive modification during the century, and the observations of Dollfuss indicate that this modification continued up to his time. The coast of Salvador follows in the same course. In the absence, however, of reliable data concerning a more ancient period than the present one it is impossible at this time to follow the inquiry with advantage, as no certainty can attach to the result.

Conclusion.

The marked deficiency of reliable information concerning the Nicaragua region is well emphasized in the reports of the Nicaragua Canal Board of 1895–96*; and it cannot be said that the information that we possess to-day, even after additional research, is more than half sufficient to properly meet the knowledge required in the construction of so momentous a work as an inter-oceanic canal. Especially lacking in precise information are the subjects of both lake and river topography and hydrography, while the data bearing upon the dynamics of the entire region leave much to be supplied.

The facts that are known at this time render doubtful, or at least open to queston, the advisability of constructing, or even the practicability, of a canal such as is contemplated. They justify careful consideration—more than that, they should be very closely weighed and calculated, especially when an alternative of construction is presented in a region, whatever else may be its deficiencies, that is practically free from the particular menace which Nicaragua presents. It stands to reason that a canal in whose construction $140,000,000 and perhaps the greater part of double this amount are to be expended, even if destroyed but once in a century, becomes an expensive undertaking; and it may, perhaps, be properly questioned whether, if the canal had been constructed a hundred years ago, along the site that is now being contemplated, it would be in existence to-day. The draining of Lake Rotomahana and the destruction of the famous "pink" and "white terraces" of New Zealand, in June, 1886, through the catastrophic eruption of Tarawera, a volcano long supposed to be extinct, point to a lesson which might easily have application in the lake region of Nicaragua.

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*The reports emphasize among other deficiences the absence of all accurate maps of the republic (p. 13), the lack of definite information regarding the intake of water by the lake during the dry season (p. 27), and the necessity of a survey of the San Juan River none having "been made since that reported by the Lull expedition in 1872" (p. 83).

Lynn Canal and Taiyá Inlet.

A Chapter in the Physical Geography of Southeastern Alaska.

BY

PROF. GEORGE DAVIDSON,

University of California.

THE GREAT OCEAN CHANNELWAYS OF THE NORTHWEST COAST.

Hundreds of miles of ocean Yosemites command the admiration of the traveler through the vast labyrinth of interior channels which extend along the northwest coast of America from latitude 47° 05′, at Olympia, to Shkagway in Lat. 59° 30′; a distance of more than 900 geographical miles in a straight line. The Archipelago Alexander alone has a length of 375 miles, by 90 miles in width. The great heights of the granite walls of the straits, sounds, canals and fiords; the narrowness of a large part of the waterways, and the extreme depths of water through them all, extract astonishment from the sightseer, the navigator, the geologist and the geographer. The general straightness, parallelism and length of the channels; the height and steepness of the intervening mountain crest lines through the Archipelago Alexander northward of latitude 54° 40′; and the glaciers in almost every cross valley north of 57°, suggest inquiry into the mechanical causes which formed them and left them in their present forms and relations.

Almost overhanging some of these channels precipitous heights of three and four thousand feet are not infrequent; heights of more than six thousand feet lie within a mile of the shore line, and greater heights are found overlooking the great fiords of the continental shore. On the main land isolated peaks reach over nine thousand feet elevation. The extreme head of this unique series of deep channels ends abruptly in latitude 59° 29′, to the northward of which the continuing valley penetrates the flank of the high range of the Kotusk Mountains, which appears to swing around from the

southeastward toward the north and west, and reaches an elevation of 7,770 feet between the passes into the Northwest Territory of Canada. At the Seduction Point of Vancouver, in latitude 59° 05′, two arms of the Lynn Canal (where it is six miles wide) embrace it and stretch well to the northward.

That arm known as the Chilkaht Inlet, and which is from one to three miles wide, carries deep water—92 to 10 fathoms—for ten miles to the northwest, to the broad, shallow, tide-covered mouth of the valley and river of the same name. At the lower and deeper part of the inlet, the Davidson Glacier has pushed its moraine two-thirds across the three-miles-wide channel, which carries 80 fathoms of water. The general orographic features of this inlet and valley are continued as a two-mile-wide valley filled with glacial detritus, now cut through by many narrow channels bearing white, icy-cold glacial waters from many side glaciers and from the summit of the pass that lies 45 miles northwest from the inlet.

The eastern arm, that on the east side of the peninsula of Point Seduction, is named the Chilkoot Inlet, and has a width of two or three miles. It stretches fifteen miles northwestwardly, parallel with the Chilkaht Inlet, and separated therefrom by a high (1700 feet) and unnamed peninsula. It carries from 127 to 60 fathoms of water. It then divides into three subordinate inlets and valleys. Of these the westerly one is five miles long and one mile wide, with 69 to 20 fathoms of water. At the head it meets a detritus-filled valley, marked by a large lake, one and a half miles from the Inlet. The valley continues some miles beyond the lake, and receives the detritus from several side glaciers, and the parent glacier at its head.

The middle branch is marked by a short deep-water bay, with a long spit nearly closing its connection with the Inlet; but the valley is continued for six miles, where it heads at the foot of the Ferebee Glacier, which receives many side glaciers in the next nine miles, and itself appears to head in the *mer de glace.*

THE TAIYÁ* INLET.

The largest and easternmost branch of the Lynn Canal continues northward as an exceptionally deep inlet, 14 miles long and one mile wide, which is continued far into the transverse mountain flank as a

* Dyea.

deep, sharp, rocky valley, or rather gorge, to a height of 3600 feet, where it cuts through the Kotusk Range, that rises to nearly 8000 feet (7770) in this vicinity. This depression in the mountains is the famous Chilkoot Pass; and the lowest part, or Inlet proper, is named the Taiyá.

This Inlet presents such remarkable physical features in its narrowness, great depth, and lofty flanking mountain-walls that it seems necessary to premise a minute description thereof by some facts in the climatology of the region, that will account for the great number of glaciers that yet exist in its immediate vicinity, and which will probably serve to indicate the probable means of this glacial channel way. And it is also necessary to say a few words of the mountain ranges between this and the ocean, and of the ocean currents upon the coast.

THE COAST RANGE OF MOUNTAINS.

Along the Pacific seaboard of northwest America there extends a long line or series of lines of closely parallel mountain chains, usually designated the "Coast Range." These mountains present a high, abrupt, and forbidding barrier on their ocean front, sometimes compact and continuous, and again indented by narrow and deep water passages with high, rocky and forest-covered shores. These passages may be long intricate channels leading into extensive archipelagoes or deep bays, sounds, fiords and rivers. As a rule, it may be said that the breadth of this Coast Range of mountains stretching toward the north and northwest is about one hundred miles. Inside of this ocean barrier lie the continental areas—broad valleys, or high rolling country, or vast plateaus of 1000 to 3000 feet elevation above the sea, the plateaus cut deeply and sharply by large rivers and their tributaries.

This system of coast mountains may not be of the same geological age, or it may not be absolutely continuous. In other words, one series may replace another, and be cross-cut by rivers and fiords; nevertheless, this mountain barrier is the great orographic feature of the west coast from Lower California to Alaska. Far to the eastward and northward of the Coast Ranges of Alaska lie other and greater ranges as far as the Rocky Mountains, but all have a general parallel direction to the northward and westward.

THE LYNN CANAL.—DYEA INLET.

OCEAN CURRENTS OF THE PACIFIC.

There passes along the eastern coast of Japan a deep, broad stream of warm water flowing rapidly to the northeastward, just as the "Gulf Stream" on the opposite side of the northern hemisphere flows northeastward from the Strait of Florida. But the Pacific stream is much the greater. This *Kuro Siwa*, or "dark blue" stream of the Japanese, has a temperature at its starting two degrees higher (86°) than the Florida Gulf Stream ; it has a greater velocity, is deeper, and is several hundred miles broad in latitude 35°. The main volume of this river of the ocean crosses the Pacific in a general east-northeast direction, and reaches the American coast somewhere in the region of the Queen Charlotte Archipelago, or probably to the southward.

Probably three quarters of these waters turn southeastward down the Coast of British Columbia, Washington, Oregon and California, with a breadth of more than 300 miles. The smaller volume is deflected northward and northwestward under the Alaskan shores, passing the coast outline of the Archipelago Alexander, westward under the ocean face of the Malaspina and Bering Glaciers, which flow seaward from the St. Elias Range, then southwestward along the southeast shores of the Kenai Peninsula and the peninsula of Alaska and Kadiah Island.

RESULTING CLIMATIC CONDITIONS.

From this body of comparatively warm water the air becomes almost saturated with aqueous vapor. This vapor-laden air is driven inland towards the dry continental areas by the southwesterly winds, and in striking the ocean flanks of the elevated coast mountains, the vapor is chilled, clouds are formed, condensation takes place, and in summer the rains are precipitated almost continuously. In winter the aqueous vapor is condensed and transformed into snow, and the mountains are covered, and the great fields of névé are supplied with fresh material. In such high regions as the Fairweather, Yakutat and St. Elias ranges, snow only is formed winter and summer ; there is never any rainfall. So far as statistics have been obtained, the heaviest downfall of rain is about 120 inches annually at the Strait of Fuca, in latitude 48½° ; 89 inches at the Columbia River, in latitude 46¼° ; 23½ inches at the Golden Gate, in latitude

37° 48′. Farther northward, Sitka, in latitude 57° 03′, receives 83 inches of rain, and thence westward the downfall decreases to about 50 inches at Unga, and 27 inches at Unalaska, in latitude 53° 54′.

In the snow regions these inches of rain fairly well represent as many feet of snow. What the snowfall may be on the Bering and Malaspina Glaciers, and on the St. Elias range generally, we may never know. The Yakutat and St. Elias ranges are the greatest instruments of direct condensation on the Pacific Coast. They rise to great heights within thirty miles, more or less, of the coast. So long as the relatively warm waters of the Japanese stream reach the coast, so long will the present snow and ice conditions continue.

One of the broad and tangible effects of the drenching rainfall at the lower levels up to 2000 feet above the sea is to clothe the coasts with a heavy growth of forest trees; and in Archipelago Alexander, and even south to Vancouver Island, with a dense undergrowth of large-leafed plants, which gives a suggestion of almost semi-tropical luxuriance and rankness.

PREVAILING WINDS.

In summer the prevailing winds are westerly with much fog. They blow over the Coast Range, where they lose most of their aqueous vapor. In winter they are from the eastward or from the continent, and with nothing in them are dry, strong and cold. If from the eastward and southward they are violent and accompanied with snow or rain. Throughout the interior there is comparatively small rainfall and snow. In the long days of summer the weather is warm and dry, and the winds draw in strongly from the ocean. One of the local effects of this indraught of the aqueous vapor-laden atmosphere into the continental area is clearly presented at the head of Lynn Canal, from which lead the Taku and other passes. The general barrier of the coast mountains in this region is thirty miles, more or less, inside the continental shore. The passageways partly breaking through this barrier are low, narrow valleys or cañons, like that of the Chilkaht River or the still narrower passes, Chilkoot, Shkagway and Tākū.

Just now these passes occupy much attention in the popular mind because of their relation to the Alaska Boundary question. The mountains on the immediate shores of these inlets reach eleva-

tions of 4,000 to 6,200 feet within one and one-quarter to three miles. The precipitous slopes are forested at every possible foothold to about 2,200 feet above the sea. The crest line of the mountains on either side of the Shkagway and Chilkoot Passes reaches 7,800 feet elevation, and is largely covered with perpetual snow. When the surcharged rain-clouds from the southward drive against this great wall of ice-cold mountains the snow commences to fall, and is driven with frightful velocity through the passes and over the range. The snow falls to such great depth that vast fields of névé are formed, and the glaciers continue their slow flow therefrom towards the waters of the inlet. Professor Israel C. Russell has vividly described his nearly fatal experience coming out through the Chilkoot Pass (3,600 feet elevation) in September, 1889, in one of these blinding snow blizzards. After a rest, and in a clear day, he ascended one of the overlooking mountains to an elevation of 4,500 feet, and therefrom he counted forty glaciers. On a recent government chart, which shows the interior only two miles north of Dyéa, (Taiyá), and thence south to the Davidson Glacier, there are exhibited no less than sixty-one glaciers, of which one has seven feeders.

THE MER DE GLACE.

These glaciers are surely the remains of a great *mer de glace* that long ago covered all the high regions and filled all the channels and sounds and straits of the Archipelago Alexander, hence southward to 54° 40′ and beyond. Climatic changes have destroyed this great ice sheet and left the present ice-fields, glaciers and furrows as evidence of its former existence. The material ground, planed and broken off the rocks in situ, by the flow of some of these glaciers and their larger predecessors, has nearly filled the Chilkaht Valley; the material brought down the small stream Kat-see-heen,* fed by six glaciers, has more than half filled the channel way of the Chilkoot Inlet, where it was two and a half miles wide. The Davidson Glacier, with its forest-covered rocky moraine (with four miles of frontage), has two-thirds filled the Lynn Canal, where the breadth was three miles and the present depth from 50 to 80 fathoms. The depth of water in all the straits and canals of this archipelago ranges from fifty to several hundred fathoms. These depths are carried far

* Heen, een, heena, sena, &c., signify fresh-water streams, &c.

up into the numerous smaller arms or fiords that break the regularity of the continental shore.

THE TAIYÁ INLET.

But the most remarkable instance of great depth grooved out by a local glacier is in the Taiyá Inlet, at the extreme head of Lynn Canal. It is fourteen miles long and one mile wide, with precipitous, compact, rocky, forest-covered sides, averaging about 4,000 feet elevation within a mile and a half of the shore. We should naturally expect this channel-way to be well filled with moraine material, especially as its mouth is banked by a deep obstruction, which has depths ranging from the visible Indian Rock to 30 and 40 fathoms, while outside the depth is 70 fathoms. As a matter of fact, no less than nine miles of the fourteen have a nearly uniform depth between 200 and 240 fathoms, or 1,200 and 1,440 feet, with the 50-fathom curve closely hugging each rocky shore.

The mountain sides on the line of the Chilkoot Pass bear the glacial marks of a former ice mass that filled the valley and crowned the coast barrier mountains. This slowly flowing mass moved down the steep grades of the Taiyá like a wonderful planing or grooving machine; it filled the narrow gorge of the Taiyá Inlet perhaps over its mile-high sides; it pushed with irresistible force the broken and ground-off materials before it to the outlet of the Chilkoot glacier; and some of these materials were left heaped up near the junction of the two arms. A change in the climate took place; the snowfall decreased; the *mer de glace* and the mountain decreased; the valley glaciers shrunk and finally retreated, but the Taiyá glacier held on longer than the Chilkoot and the Chilkaht. Its high walls were steeper, and it had grooved out the inlet to greater depths. Its terminal moraine at Indian Point was nearly the last of its dynamic efforts; it retreated mile after mile, until it left the present water-level at fourteen miles, and has virtually disappeared from the narrow valley to the pass.

This long, deep, narrow channel of the Taiyá Inlet and its submarine moraine are the geographical and geological witnesses to the former greatness, activity and decadence of the Taiyá Inlet glacier. There are other instances of similar phenomena, but no other where the evidence has been mainly rescued from the depths of the sea.

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An Expedition between Lake Rudolf and the Nile.

BY

DR. A. DONALDSON SMITH.

In 1895, when my first expedition reached Lake Rudolf, it had been a whole year on the march. I had reached my goal, and my expedition had been successful also in exploring much more new country than I had anticipated, so I contented myself in making a fortnight's journey up the Mela river. On this side trip, however, I made up my mind, on looking across the vast expanse of plain towards the west, that some day I must pursue the setting sun from Rudolf to the Nile. I continually watched for an opportunity to satisfy my desire. Since I could not do this at once, I filled in a part of the intervening time by a journey through some of the unknown parts of the Khingan range in Mongolia in 1897, a short account of which was published in the Royal Geographical Society's journal of May, 1898.

The whole of the winter of 1898-1899 I was in the jungle in Somaliland, hoping for an opportunity to cross the border, but owing to political reasons and to the gratuitous interference of the Consul-General, I was unable to put my project into execution until midsummer. During May and June, while negotiations with the Foreign Office were under way, I employed my time in recruiting twenty-eight Sikhs and Gurkhas in the Panjab. I thought it advisable to enter *via* Kismayu, but the Mombasa local authori-

ties stopped me. To be brief, I fitted out three distinct expeditions before I managed to get finally out of the reach of incomprehensible officials. I started from Berbera on August 1, 1899. After the first march eleven of my Sikh ex-Sepoys deserted, having become aware that they must sweat occasionally, and that they could not be supplied with all the manifold luxuries they were accustomed to in the Indian army. Knowing that I should never succeed if I took one of the officially recognized headmen with me, I had great difficulty in getting Somali camel-men, since all the Berbera headmen formed a ring against me. Several camel-men having deserted me at Hargeisa, and fearing further official interference, I started across the Haud with only seventeen Somalis, and as many Gurkhas and Sikhs, besides my Scotch assistant, and my excellent Goarnese cook, kindly lent me by Captain P. Z. Cox. During the journey to the Shebeli river *viâ* Milmil, Sesabane, and Sheneli, I increased my following to forty-eight men. Near Milmil a small caravan of camels and women which was following us was attacked by three highwaymen. One of the robbers was captured by my boys and brought before me. He was a lad of eighteen, with wiry limbs and an intelligent expression, and struck me as a likely recruit, and a better brigand than the majority of my men. So I contented myself by making him march handcuffed for a day, and then enlisted the homeless fellow as a camel-man. He became known as Ali Hatbury, or "Ali of the handcuffs," and proved one of my best boys.

My surveys began immediately upon leaving Sesabane. Although I had with me all the most recent maps, the "tug" Fafan had been given no resting-place by chartographers. All the way to the Juba river Mr. Frazer and I had work to do filling in to what had been to all intents and purposes a blank upon the maps, except where I came upon my old line of march in 1895 at Turr. Sportsmen had knocked about the country in places, but they evidently never thought that Tennyson's idea of a brook applied to a tug or wady from the different positions the poor sandy river-bends were made to assume.

At the end of our march on September 8, we reached the Shebeli river at a spot called Godi, over 400 miles from Berbera by road, and crossed without unloading the camels. It contained only from two to three feet of water in its deepest part. So dry

was the country about the river that I pitched my camp in a dark grove of immense cedar trees within a few yards of the stream, not having to fear malarial poisoning. Not a single mosquito disturbed our rest at night. On September 11 we started west again across a rich river-made plain, passing numerous villages of Aulihan and Dagodi to the foot of the highlands, which intervene between the river Web and the Shebeli. We followed up a tug to its sources in these highlands, and found many pools of water in it. Considering the extreme dryness of the season, I believe this tug must usually be a flowing river. The natives would sell us nothing at any price, although they were rich in live stock. For the next few days we experienced a delightful change from the trying heat of the low plains, where the mean temperature for the twenty-four hours was over 90° Fahr. The plateau was only 2,500 feet above the sea, but that was a sufficient elevation to give a slight tonic effect to the atmosphere. The land was only suitable for grazing purposes to a limited extent, since the granite and iron ore, of which the hills were composed was bare, or else covered with a thin layer of sub-soil, which supplied nourishment to a tangled mass of mimosa and acacia trees and bushes. Inhabitants were consequently very few, and giraffes very plentiful. Water is to be obtained in holes in the rock.

Near some villages called Mucha, which we reached on September 14, there were some remarkable deep rock wells. Two days after leaving these we descended from the plateau and reached my old line of march at Gohulle. From here until we reached the Boran at El Dere I cannot add to the description I gave of the country when I read my paper before the Society in 1896. The rivers Web and Juba had only half their usual supply of water. The people were flourishing, and nothing could have exceeded their meanness in not wishing to sell us food, which made it most difficult for me to keep my men supplied, there being also little game on our line of march. The Boran, on the other hand, were most friendly. I must here refer to the Abyssinian method of annexation. In 1895 I saw the worst side of their treatment; but on my recent journey I found that their treatment of tribes, once thoroughly brought to submission, was commendable. In their first attacks they are certainly very cruel, but later, when the natives have been so harried that they look upon their masters

with the greatest respect, they are given back a good proportion of their belongings and very nearly their original self-government, but a moderate tax being imposed. From the Somalis to the Boran I was surprised to find the natives quite as rich apparently as they were before they had come under Abyssinian rule.

Since I could fill in many blank spaces on my former map before reaching Lake Stefanie, I started my survey work again at El Dere and continued it to the Nile. Marching in as straight a line as possible from Berbera, El Dere may be considered to be 750 miles by road and the same distance from the Nile. Three long marches from El Dere to Le lead us through a very wooded and broken country, where elephants abound and man is a rare visitor. There are many mountains scattered about, principally of limestone rock, and the deep wells at Le I now believe to have been originally formed by the disintegrating effect of water on chalk, in which the natives have actively assisted. My Somalis gave me infinite trouble and annoyance. They were never satisfied unless they had over ten pounds of camel meat or mutton a day per man, and when food was scarce I had to be constantly on the alert to prevent them from poisoning my transport animals, so that they could eat the meat, or from stealing sheep, but they were not, however, as miserable petty thieves as most of my Indians. All but four of them mutinied at a place called Goff on November 4, and remained out over night, putting me in a decidedly disagreeable situation. If I call my Somalis howling, hungry humbugs, I describe some bad points of their character, but it would be unjust for me not to mention their superb physical condition, swift-footedness, and endurance, and their intelligence, which made them compare favorably with the Indians. Of my nine Gurkhas, five only were pure-blooded men from the backwoods of Nepal, and these were among the best men in camp. The other four Gurkhas had Rajput or other blood in their veins, and it is with regret that I look upon them as human beings. These latter, and as many more Sikhs, continually strove to commit suicide by hiding if the march was long, and gave me and the Somalis infinite trouble in hunting them up. Three Indians were cunning enough to evade the Somalis search-parties sent after them at different points on the journey, and were never heard from again. Whenever the march was protracted over

five hours, either I or my assistant fell back far to the rear of the caravan to protect tired Indians from themselves.

Between Goff and Lake Stefanie the Abyssinian highlands are continued south as a long mountain chain all the way to Mount Karoli and Marsabit, near the southern end of Lake Rudolf, a fact that I was not aware of on my first journey. Proceeding westward three marches from Goff, and passing Egder, we arrived on November 8 at a large settlement called Gorille, at an elevation of 3,000 feet, where the people welcomed us with large vessels of honey and milk. There were Arab and Somali traders among them from Kasmayu, buying ivory in exchange for cattle.

On the next day we rose over 1,500 feet to Mega, a beautiful broad open meadow or series of meadows between mountain peaks, into which tiny watercourses trickle, and where there was a delightful freshness in the atmosphere and in everything living. Besides the many cattle, sheep, goats, and donkeys, which were to be seen grazing on the fine green grass, we were much impressed by the numerous droves of sleek ponies. For some reasons the natives west of Egder did not wish us to be a witness of their wealth, and whenever we managed to get a guide from them, he persisted in taking us by the most unfrequented paths, and away from the western course, which I was determined to pursue. I had finally to give up trusting in guides altogether; load up a two-days' supply of water on camels, and march ahead. We camped when we got tired, irrespective of water or people, and then sent men in all directions to prospect. As it turned out, we usually found water and villages not far from camp, though with a considerable amount of trouble. We marched rapidly along easy paths after leaving Mega, through the same green upland basins, for a little over four hours, all of us reveling in the delicious cool atmosphere. The good old Gurkha Havildar voiced the sentiment of the crowd by exclaiming, "Ah, Sahib, if we could always have it like this!"

We were at an elevation of over 5,000 feet, when suddenly, on rounding a little promontory, we were brought to an abrupt halt. We found ourselves perched on the edge of a precipice that sheared off almost perpendicularly down to a broad plain 1,700 feet below us. Across the plain, some 30 miles to the west, rose

what appeared to be a low mountain range, the southern extension of the Tertali mountains; but the plain itself we found to be over 3,000 feet above the sea-level, a no mean elevation compared to the valleys of Lake Stefanie and Rudolf. On my first journey I crossed this plain 80 miles north of here, where it was only a narrow valley running up to its origin in the Amara mountains. The view was, indeed, magnificent from this great wall, the western edge of the Boran highlands, which run from Amara to Marsabit, but it was appalling when I came to consider how my poor camels were to get beyond it. To my surprise, we found a winding path had been laboriously made by the natives for their donkeys, many stones, weighing two or three tons, having been rolled aside. We set to work on this road, and after a day's hard labor got it in fit enough condition to take the camels down empty. All the loads were carried down by my men, and then the long line of grunting, stumbling, patient, "ounts" were shoved and lifted after. In spite of the inimitable Kipling, I have the greatest respect for the long-suffering camel. On this occasion only one animal was injured, but he was afterwards consumed by us to his last marrow bone. Thus you see that the good that a camel does is not interred with his bones.

There were numerous villages about the foothills and on the plain, and many natives helped us down the paths. The most important settlement, about an hour's march from the foot of the mountain, called Saki, was in a most flourishing condition, judging from the large numbers of cattle which the people owned. A couple of marches west of Saki we got into a very bad, washed-out, stony country, where the plain was cut into hideous designs by the rushing of the waters in times of flood. A guide which we had got at Saki insisted on going to the north, which I would not do, so I felt that I had only myself to blame for getting into the bad land. It took five long marches to get across the plain on account of several stretches of this character. A specimen of one of the tiny gazelle, or dig-dig, of this plain, which I presented to the British Museum, has been proven to be new to science by Mr. Oldfield Thomas (*Madoqua guntheri smithii*). On November 19 we were on the mountains again, and not far from the south-east end of Lake Stefanie.

There was one rather isolated mountain called Janissa, 5,600

feet high, which I decided to ascend while my camels were resting. From the top of it I got a splendid view, and picked up most important points of my previous journey—Mount Kanjaro, the Tertala range, Lakes Stefanie and Rudolf, and Mount Karoli—and could thus check my work, which I was most pleased to find correct. The trip was not without other advantages also, for on the very top of the mountain I bagged two specimens of *Cervicapra chanleri*, a beautiful antelope not known to exist near Lake Stefanie. Two marches beyond Mount Janissa we came to what appeared to be an enormous barnyard, with a solid stone floor and in the centre a bubbling warm spring. The water was sparkling with carbonic acid gas, tasting like acidulated seltzer, and it was evidently the drinking-place of many scores of elephants, judging from appearances. Elephants were ubiquitous; you could scarcely move in any wooded valley without disturbing many of them. The next day we were well down in the valley of Lake Stefanie, and looking forward to plenty of fresh fish and plenty of water for washing.

On November 26 we made an afternoon march to the southeast corner of the lake. Seeing a herd of elephants a long way off, I left the caravan, directing Mr. Frazer to march on to the lake and camp. After almost running an hour or more to catch up with the elephants, I came upon a herd of buffalo, and picking out a good bull, preferred him to the tuskers. Killing the bull and cutting him up took considerable time, and it was not until near sunset that I came in sight of the camp. To my horror I saw nothing but blazing grass where the camp should have been, and on some rising ground, covered with smoking ashes, stood the boys, looking like the central figures in one of Doré's conceptions of the Inférno. I certainly thought my ship had been burned up, but my boys were only resting a moment after their heroic efforts to save the kit, which they had accomplished to the last camel blanket. No wonder my camel-men's faces looked doubly sad when they brought me a tin of water and asked me to taste it. It was the briniest water I ever touched, and then I, too, felt sad. I learned that the lake with its undrinkable water was two miles away over a sea of mud covered with dead fishes. I only had two small barrels of water in camp, which I always carried for emergency, and these I divided immediately among

the poor, parched boys, who had been fighting the fire. Every man was tired, and yet I had to send at once several boys with camels to travel all night back to the mineral spring and fetch water the next day. Here is where the Somalis showed their pluck. Not a man that I ordered out objected, since it was a question of life or death. Other Somalis I sent in all directions to follow the paths made by the countless myriads of animals, and learn where they drank. Most of the Indians were dead to all intents and purposes, and considered themselves to belong already to another world. Luck was not so much against us, however, for in two hours my camel-men had found a spring of fresh water by following elephants' spoor, and soon after this the Indians were resurrected by a gallon of water each.

I will pass over our journey from this point to Lake Rudolf, which we reached on December 9. The formerly rich tribe of Rusia had ceased to exist, and except a few representatives of the Hamerkoki tribe, we saw no human beings at all until we reached the river Nianam. The water was 12 feet lower in the shallow lake than it was in 1895.

I was quite surprised at first at the manner of our reception by the Murle and by their poverty. The rich villages that welcomed us in 1895 did not exist. There were only a few little groups of huts, principally on the west bank of the river, that showed the remnants of a once large and flourishing tribe. We spent nearly a whole day endeavoring to get the people to come to us; but finally, when we gained their confidence, they were most eager to assist us. The secret of the natives' distress was to be found in Abyssinian raids. With the help of the natives and their canoes we easily crossed the Nianam, which was half dried up like all the streams we had crossed. On my first journey I followed up what I supposed to be the Nianam for a long distance to Mela; but since I was there that illustrious explorer, the late Captain Bottego, discovered that the Mela river made up only a part of the Nianam, and that this was joined at Gumba by another river, the Omo. It is clear to me now that my river, which I will call the Mela, and the Omo together in equal volume joined to form the Nianam, the name given by Count Teleki to the large stream flowing into the lake.

A remarkable change now occurred in the fauna. Not only

did we find a completely different set of birds between the Nianam and the Nile, but scarcely any of the mammalia that we had been accustomed to were to be found in this western section. The Soomerings gazelle had given place to the larger Boran gazelle, and now this had disappeared to make way for a smaller variety without any longitudinal black stripe on its side, and which Mr. Thomas has proved to be new after examining a specimen (*Gazella grantii brightii*). The bouncing, nervous, long-necked Waller's gazelle, which had been a constant companion, was nowhere to be seen, but oribi and reedbuck took its place. Speake's gazelle was replaced by the beautiful *Gazella thomsoni*. The hartebeests, as a matter of course, thought it best to give themselves differently curved horns, and to go under the name of *Bubalis lelwel*, Heuglin. The birds were represented by curious scarlet-breasted barbettes, with their enormous dentated bill for cracking hard berries; by curious tiny flycatchers, with large scarlet wattles around their eyes; and by more than a hundred other different species, all of them strikingly beautiful, belonging principally to the West African types. Many troops of monkeys made the tall forest about the rivers and ponds ring with their chatter. The most beautiful of these, a large horse-tailed colobus (*Colobus guereza poliura*), was also found to be new.

I may mention here that from the time we left the Boran gallas until we reached Arabic-speaking natives near the Nile, we could communicate with none of the tribes except by signs, unless we remained long enough at some village to pick up a few words of the vernacular. I had hoped to find some Masai, but there were none. The whole way to Tarangole the natives refused to give us guides, although they were friendly in other respects. This was to be accounted for, I suppose, partly in my refusal to pursue any other than a westerly course, when the natives advised my going north or south, or even east again, and partly through fear that the guides would be killed by their hostile neighbors. We kept our course, however, although we literally got into many a hole, and struck out each morning regardless of paths, waterways, or dire prophecies on the part of the natives.

The day after Christmas we bade the Murle good-bye, and struck out in a northerly direction that would bring us to the [illegible] t stream makes an acute angle as

it bends from north to east around the Mela hills. At the end of a long march over a grassy open plain, we came to a place where the loose fire-clay which underlay the sub-soil of the plain had been cut away by the action of waters to a depth of 50 feet, and in the deep, round basin a dense forest of giant sycamores, mimosa cedar, and tamarind trees stretched before us for about two miles. Finding plenty of elephant paths, we wandered through the dark woods the next morning until we came to a pretty lake a mile long, in which a school of over a hundred hippopotami disported themselves. This lake I called Hippo pond for convenience. The forest was alive with animal and bird life. The elephants were, indeed, so numerous that their stench was most disagreeable. From here to the river the land was so cut up that we did not reach the Omo until we had made a second march in the afternoon. I may say that most of our day had been spent in passing around and over little hills of crumbling clay. The Mursu, whom we found on the banks of the Omo, had escaped the raids of the Abyssinians, and were in a most flourishing condition. After we had shot a couple of hippos for them, they became most friendly, and brought us much food, consisting of durrha, or sorgham, lentils, beans, maize, and dried tamarinds. I bought a small tusk or two from them at first to start trade; but when I discovered a long line of ebony-like forms bearing about a ton of ivory on their shoulders to my camp, I had to cry a halt, as it was impossible for me to transport more ivory than I then had with me.

The Mursu and Murle are identical in speech, customs, and appearance, but the Mursu have more of the warlike spirit of the Turkana than the Murle. The Mursu shave their hair well up from above their ears, and also behind the head, a custom observed by the Dume, Bunno, and other tribes living to the north of Lake Stefanie. Moving along the river with camels was hard work, owing to the thick forests, in which much cutting had to be done. Several of my camels died from eating a poisonous vine, and many were made so ill that they never recovered. I have found it always dangerous to allow camels to remain in forests along rivers or lakes for any length of time.

On January 3 we left the river, and, proceeding west, arrived on the second day's march at another little pond at a point where

several river-beds unite in one very deep and wide ravine. Thence our route lay across a fertile, river-made plain to the base of a low mountain range. I have little doubt, from what I saw of the valleys passing to the right and left of the various mountain ranges and from levels taken, that Lake Rudolf, the Nile, and the Sobat were once united in a vast inland sea. A couple of hours' climb on January 6 got us over the crest of the first range of hills and on to a valley 15 miles broad, which provided excellent grazing to the numerous domestic animals which the natives of these parts owned. The waterways contained plenty of water in pools, and there were many broad stretches of open pasture, while the lower hills surrounding the plain were almost treeless, but covered with fine green grass. On the west, a splendid mountain range ran for 20 miles along the length of the valley; the highest point, Mount Etua, over 7,000 feet high, stood out in bold relief as a bare-pointed volcanic remains—a splendid point for surveyors, and a magnificent mass from an artist's point of view. We saw this point from the Omo river, and did not lose it until we were 40 miles the other side.

Almost all the natives fled to the hills on our approach, and seemed inclined to fight. From their long, parallel-sided shields, their Masai-like spears, and their tall, athletic build, I made them out to be a branch of the Turkana. A lot of (about twenty) warriors attacked two of my camel-men one day, who were loitering behind the caravan with my sheep and goats, and were only driven off by my boys firing at them. This was the only time on the journey that the natives attempted hostilities. The people here call themselves Muchas, but I could not get any vocabulary from them, as I only managed to get speech with them on two or three occasions before I was about ready to quit their country. We kept pretty much to the valleys, which were at an elevation of 1,700 feet, as we progressed through their country for seven long marches, occasionally going over some mountain passes, where stretches of open upland meadows and grass-covered hills, made me feel that I should be wearing tweeds instead of khaki. In such places there were usually a good number of small villages, but occasionally, where the bush was very thick, we sometimes did not see a sign of any inhabitants for a distance of five miles. I frequently saw the male members of the tribe, and

tried to get them to approach the caravan, but in vain, and occasionally I met a few old women who had remained in their villages while the caravan passed them, and once a dozen hunters came into camp to sell ivory. I bought a few ornaments and a beautifully tanned goat-skin apron from the women, which were very like the things in use among the Turkana. Except for the goat-skin apron worn by the women, the Muchas contented themselves with the same cleanly nakedness that was the fashion from the Boran to the Egyptians. The taller mountain ranges of this country were of volcanic origin, and in many cases their slopes are covered with abominable brecchiated rock, principally granite, while most of the flat-topped hills were composed of argillaceous sandstone and shale. The surface of the valleys, which are for the most part covered with bush and forest, is composed of the richest alluvial soil underlaid with clay. To the south of our line of march the broad, yellow, grassy plains were considerably below 1,700 feet from the sea-level. In a large valley at the outskirts of this country we remained a week to rest the camels, where a shower or two of rain had freshened up the foliage of the mimosa bushes. A day or two before we left the natives living in the vicinity began to come to camp, finding that we did not disturb them; and if we had remained longer, no doubt we should have been on intimate terms with the whole tribe. They did not care to sell me any sheep, however, and for this and various other reasons connected with my outfit of men and camels, I thought it best to push on. While here we had the last of the autumn showers.

Since the changing climatic conditions of East Africa is now a subject of much importance, I must not omit to mention some of my meteorological observations. It is well known that the "karif," or fierce winds, that sweep the Somali coast in the summer months are a part of the northern trade winds. Now, these northerly winds persisted until we had got well beyond Lake Rudolf, and with them came a little rain. It was the autumn rains that are expected in Somaliland in September which first struck us in a sudden burst after we had left the Dawa river on October 13. These rains followed us all the way to our camp of January 13. They were very scanty, but it was curious that they should progress so from east to west. Half a dozen slight showers w

all that any particular section of the country received. The reason that Somaliland and the lowlands to the south of Abyssinia are so dry must be found in the drying effects of the Abyssinian highlands on the northern trade winds, the lofty mountain ranges condensing all the moisture in the air, and allowing only a pitiful drop or so to work south. All the rivers and lakes which came under my observation were half dried up—surely because there was a scanty rainfall this year in the Abyssinian highlands. The secret can only be solved by a study of the changes that occurred in the northern trade winds. Hardly had we left our camp of January 13 before we began to see the natives preparing for a spring rain, and a spring rain depended upon the monsoon winds from the south, which gives life to Uganda and most of the East African Protectorates. Thus we had arrived at a point where the autumn rains of one country, dependent on the northern trade winds, would have met the monsoon rains coming from Madagascar had not these been extremely late in arriving this year, as they were in reaching India. The famine which we found to spread all along the upper Nile was dependent upon the same conditions as the famine in India, and the very low condition of the Nile at Cairo was caused both by the changes in the monsoon and also by the northern trade winds, since the Sobat rises in Abyssinia.

On January 21 we ascended a steep pass to a long, narrow plateau, over 3,000 feet above the sea, the game path which we took leading us along a beautiful clear-flowing brook shaded by tall cedar trees. A pool in "Cedar valley" near our camp at the top of the pass afforded us the opportunity of indulging in a delicious cool plunge. The men I had sent ahead, and who had found the trail up Cedar valley, did not go far enough across the flat top of the ridge, and consequently did not discover that this ended abruptly in a sheer precipice on the other side. Beyond, to the west and northwest, stretched a vast plain, as far as we could see. For a distance of about 30 miles the plain did not look so unattractive with its occasional little watercourses, fringed by many a pretty bit of green meadow or shady grove, but toward the horizon the monotonous grayish-white appearance of the surface looked very ominous. We spent three days on the top of the mountains in finding a game trail, and clearing this

so that the camels could descend. Game was abundant, and it was in this country that I secured the specimens of the new gazelle, which I previously referred to, and also two varieties of buck, *Aurebia haggardi* and *Aurebia montana.*

At the foot of the hills we crossed at right angles the line of march of the late Captain Wellby. A couple of marches beyond this brought us to a large watercourse flowing west, where we found a new tribe of natives, the Magois. Noticing from the distance that the people were preparing for a fight and driving away their cattle, I pushed ahead with two boys, and persuaded them to desist from their hostile exhibitions. One stout young fellow in particular persisted for a long time in giving frequent leaps into the air to show that he would fight if called upon to do so, but this man proved afterwards to be as friendly and as jolly as he was fat.

The Magois were distinctly different from any tribe previously met with on the journey in appearance and customs. They had the heavy build and large features, with high cheek-bones, of the Soudanese, and, above all, the lines of raised tattooing on their cheeks that is so typical of the people about the Nile. I believe that it is not unlikely that they are a branch of the Dinkas, who, perhaps, being driven from the Sobat by the Neurs, put the desert between themselves and their persecutors. They seem to care principally for small red beads, of which they had many already, some of them worked in gorgeous patterns on leather plaques, with which the warriors adorned their massive head-dresses. The most *outré* of our fashionable young men can never aspire to the height of collar worn by some of the Magois. With a collar of beads, which shoved their chin high up in the air, their locks done up in a great chignon, composed principally of clay covered with ostrich feathers, they looked the very pink of gay deceivers.

Parallel lines of raised tattooing on the chest and abdomen, leopards' skins hung over the back, and a bell hung on a slender cord around the waist, helped to liven up the men's appearance. These are the only people whom I have ever seen wearing a zebra's tail suspended from the elbows. Many of the younger girls had rather attractive features and pretty figures, but I will not mention the appearance of the fair sex after they get to be

twenty. The worst burden which they have to carry in life, however, seems to be the countless necklaces of beads which spread over their bosoms to the waist, and the large bracelets and anklets of ivory, brass, and iron. Their hair is shaved above the ears, and cut fairly close on the top of the head.

The Magois represented to us that if we went northeast again we would find a stream of water winding northward about the foot of the mountain into a bigger river a long way off, but I had no intention of going to the Sobat and thus leaving my work incompleted. Whenever I asked one of the natives about the plain to the west, he would draw his hand across his throat to represent that we must surely die if we attempted to march in that direction. However, we loaded up all our water-barrels and started on January 28 in a westerly direction, toward two mountains which loomed up on the plains. For a short distance the ground was firm, and we marched along swiftly, but then we came to the worst cotton soil I ever took men or beasts over. It was so loose that we sank in it up to our knees at one moment, while at the next instant we stumbled in some crack hidden by a tuft of the coarsest yellow grass. The intense heat added to our burdens, so that we were glad to camp at the end of seven hours.

The next day's march was even worse than the first, and at the end of it I determined to stop and hunt for water about the two mountains, which were then near us. At the end of thirty hours the barren mountains and all the plain for many miles to the west had been scoured for water, but in vain. My animals had been nearly three days without food or water, so that there was nothing to do but to look disappointment in the face, and turn back to Magois. Two of my men found a stream, before reported by the natives, running north, where they told me there were many people and signs of cultivation. This was the stream I have since learned was followed by Captain Wellby to the Sobat. It starts in the mountains northeast of Magois, and not far away in the south.

Another of my scouts reported water directly east, and nearer the Magois, so in the afternoon of January 30 we started off in the direction indicated. My own Somali had been lying to me, since he had only seen what appeared to be a promising

waterway, and took it for granted there was water in it without fully satisfying himself on the subject. Owing to this blunder we had one of the worst marches the next day that we experienced throughout the journey. From three o'clock in the morning until all hours the next night the wearied men and animals plodded on in intense heat, and over the same terrible ground, to a pool of water which I finally found in the Magois river-bed, not far to the east of the Magois villages. At mid-day I distributed the last of the water we were carrying, which gave the men three pints each, not enough for many of the men, especially the Indians, but sufficient for Mr. Frazer and myself, although we had harder work to do than any of the escort.

At 5 o'clock, when I reached water, there were only a few boys and two camels loaded with empty water-barrels with me. These barrels were soon filled and sent back to revive the broken-down men, who were being taken care of by Mr. Frazer many miles behind; and then came the hunting up of the camels and donkeys, which had been deserted by their camel-men, and which were roaming about in the dark among the bushes with all their loads on them. All the men we got safely into camp during the night or the following morning, but I never recovered from the loss which I sustained in transport animals. Some five camels died within the next two days, and as many more within a fortnight; five donkeys were lost, not one of my two dozen sheep and goats ever reached camp alive, and many boxes were injured. I was obliged to throw away much valuable kit. Besides this, the men became so disheartened that they never afterwards recovered from their apathy. Two days after this found us back again among our friends, the Magois.

We determined now to follow the wady as far as we could, even though it took us a little south of west. Two short marches on February 5 and 6 brought us to a long pool of still water, but here the river bed spread out in many little dried-up ditches, that lost themselves within a quarter of a mile on the plain. Here we found another branch of the Magois, who called themselves Katua, and represented that they were very independent of their immediate neighbors, and at war with a tribe called Toporan, living in the mountains west of Turkana. The Katua occupied a dozen large villages, and owned an immense number of cattle

and other live stock. Although rich, they wore scarcely any ornaments, and did not care much for any other kind of beads than the wonderfully fashionable little red sim-sim. Trading went on merrily until I had bought about sixty sheep and goats, and my stock of red beads was geting low, owing to the many drains upon it. Cloth and blue and yellow beads, of which I had a large supply, were valueless. In the trading the women figured largely, to my great annoyance, as they were so long in making up their minds, and so hard at a bargain. I was obliged to play salesman to these women for many hours a day, and I often wondered if European salesmen ever have to exert the same amount of patience.

To my surprise, I discovered these people to be cow worshipers, and to indulge in certain rites which were supposed to be peculiar to the Hindoo religion. Plastering themselves with cow-dung, and throwing bits of dried *bois de vache* at every one and everything they liked, seemed to be a matter of much import to them. Occasionally some old man or woman would be quite unmerciful to Mr. Frazer and myself in giving us a too generous dusting. The origin of this cow worship is presumably the same with the Katua as with the Hindoo, traceable to the great dependence placed upon the animal for sustenance. The Katua eat the cow, but all their people turn out when the beast is killed, and go through much ceremony. They would not sell me a single cow.

We were again confronted by the waterless plain to the west, but to the southwest, however, rose a mountain range 40 miles away, that I thought must surely provide water, and thither I accordingly sent Ali Esa, whom I had made headman, and seven other Somalis with a week's supply of water and food to reconnoitre. I employed my time that was not given up to trading in survey and collecting and studying the natives, of whose language I made a short vocabulary.

Just here, for the first and only time on the journey, we found a number of Rüppel's reed-buck (*Cervicapra bohor*). This animal was first described by Rüppel eighty years ago from a skull and pair of horns, and since that time some half a dozen pairs of horns have been brought down the Nile from the region of the Sobat by Arab traders, but it was not until the arrival of my skins

at the museum that all the characteristics of the animal were known. It stands 40 inches at the shoulder, and is remarkable on account of its pretty, light yellowish hair, and the peculiar forward bend of its horns.

The natives were very busy moving their villages to the hills in anticipation of the spring rain, and by the time my scouts returned, there was scarcely a soul left in the huts by the river. Ali Esa returned on February 12, and to my great relief, reported water and people at the mountains before mentioned. We set out, therefore, once again across the abominable plain, and after four long marches arrived on February 15 at some wells situated among pretty hills, the most northern extension of the Uganda highlands. Far away to the south we got glimpses of great rocky masses, towering about 7,000 to 8,000 feet above the level of the sea. The friendly natives, who are called Akara and Dinga-Dings, did not understand a word of the Magois language, nor were they as heavily built or as black as the latter. Fairly tall and slender, with small features and moderate-sized noses, they resembled the Masai more than they did the Soudanese. They are again different to the Latuka, their immediate neighbors on the west.

Two more marches in a northwesterly direction took us across as many very broad, dry river-beds, in which the groves of handsome raffia palms, with their ripe yellow fruit, made a great display. The country was very thickly populated by the Akara, who seemed delighted to have us come among them.

According to old maps of this region, which were founded entirely on native reports, several running rivers should have been crossed by us on our journey from Lake Rudolf, one large one running north into the Sobat, and several others running northwest into the Nile. However many streams may rise in the tall mountains to the south, the water disappears except in the rainy season as it approaches the ghastly plain, and even the sandy beds themselves are soon obliterated in this great desert of the Sobat. Mr. Frazer and I made side trips to all the most northerly hills of the Akara, in order to secure further bases for the triangulation to the west, and to trace the courses of the wadies, which finally disappear on the surface of the plain not far from Katua.

Keeping westward across a broad valley, we came to many more of the Akara, who were agriculturists as well as stock raisers, and had substantial large wooden dwellings with peaked roofs. Some of the villages which we passed could easily have contained fifteen hundred souls or more. Although friendly and eager to trade, the Akara were very annoying in not pointing out to us where water lay to the west of each camp. The wadies, which contained water in pools and wells, ran only from south to north, and I suppose the natives thought me excessively stupid in not following these river-beds instead of intersecting them at right angles, which involved long marches across hot plains and a hunt at the end for water.

Near our camp of February 21, in a large open forest, I shot a male and female spotted bush-buck (*Tragelaphus bor*, Heuglin), much to my delight, since they are the only specimens of this beautifully marked animal that have ever been secured.

On the 22d we rounded the extreme northern end of one of the arms of the Dinga-Ding mountains, and camped near some villages at Lumin. A plain or valley similar to the one we had just crossed stretched before us to another arm of the southern highlands. We had some water difficulties crossing this plain, since my few remaining camels were loaded heavily enough without my burdening them with water. Some camel gave out almost every march, which necessitated my throwing away more and more loads. Although there was much to interest me, I cannot reflect on my journey from the time we reached the great desert of the Sobat until we arrived at the Nile with pleasure unalloyed, for shoving along a caravan of dying camels and would-be dead Indians, by the help of careless Somalis and a few tired though good Indians, for many weeks is a thing that one cannot forget. We were soon to meet more Soudanese tribes, the Latuka, together with the Okatela and Beri.

The Akara, Dinga-Dings, Turkana, Muchas, Mursu, and Murle seemed to belong to the Masai and to the aboriginal pigmies who live north of Lake Stefanie, and to have nothing in common with the Soudanese.

On February 27 we reached some pools of water on the plain, not far from the Okatela mountains, and the same afternoon my boys reported many natives to be watching us in a suspicious

manner. Two of my Somalis, whom I had sent to the mountains in search of water for our next march, came back in the evening with strange tales of the natives trying to surround them and take them prisoners. They also reported very many large villages in the hills. I wished to pass around the northern end of the mountain range and proceed straight to Lado, but the reported attitude of the natives decided me on taking the southern route to Tarangole. Although there was but slight danger of not placating the natives, I was particularly anxious just here to avoid any risk even of a fight, since I was near Tarangole, the most northerly point of Major Macdonald's expedition, where friendly arrangements had been entered into between the English Government and the native chief. Two marches brought us to Omin, a very large village near Tarangole, perched on a hill called Alanga at the foot of the mountain. During most of the morning's march crowds of natives, armed with spears and bows and arrows, followed the caravan at some distance in an unfriendly manner. After a time, however, others more civilized from near Omin joined them, and these latter approached to within 100 yards and made friendly advances. The best course for me to pursue was to go over to these people without escort, and the result was even more than I expected. In a couple of minutes the natives were crowding round me, patting me on the back and grasping my hand in a rather annoyingly familiar manner, that showed plainly enough that they were greatly relieved to find that we were not a hostile party of Egyptians or Mahdists, from both of whom they had received many unwelcome visits since Sir Samuel Baker's time.

At Omin we found quite a number of blacks dressed in loose white cotton suits, such as are worn by Soudanese townspeople, or occasionally in Dervish "jibbas." Each man who wore any clothing carried some old musket or rifle, of which he was immensely proud, even though the weapon were useless. The people were all under the chief Amara of Tarangole and Loguren, who only allowed those who carried rifles to wear clothing, or who, in other words, gave to any bit of cloth the dignity of a uniform. Whenever a man laid aside his rifle he also disembarrassed himself of all clothing. There were strangers here from many Soudanese tribes, some of them deserters from the

Khalifa's forces after the Belgians had destroyed the Dervish influence on the upper Nile.

It was an agreeable change to meet natives who had some knowledge of Europeans, and with whom we could converse through the medium of Arabic. The great strength of the people, however, lay in the magnificent physique, pluck, and skill in the use of the spear and bows and arrows of the proud young men who never knew the use of cloth, and who do not imagine that there is a power on earth equal to that of their king Amara. The one great ornament of these warriors is a heavy helmet made of brass plates, laid together on a frame of interwoven grasses. It has the appearance of a solid brass Crusader's casque, and when worn easily by jaunty and graceful warriors the effect is most striking.

We spent nearly two days at Omin, during which time I arranged for a rendezvous with Chief Amara, at a village called Lorkale, some six miles north of his capital Loguren, and near Tarangole. Since I had now picked up many points of Colonel MacDonald's survey, and found them to have been relatively very correct, as were those of Major Austin at Rudolf, I dropped my triangulation after leaving Omin, and carried on my chartographical work to the Nile by means of a pocket compass and dead reckoning. I had wrongly judged that the country to the west of Tarangole had been thoroughly explored by Emin Pasha, Sir Samuel Baker, and by members of the McDonald expedition, but I find my map to be the only one giving any detail.

On March 2 a tramp of four hours west, principally through a highly cultivated country, brought us to Lorkale, where we were joined by King Amara in the afternoon. We were quite unprepared to receive so great a chief. Accustomed as we had been to meet with petty chiefs ruling generally but a single village, we were rather taken aback at the display made by this commander of perhaps 25,000 warriors on his visit to our camp. He was accompanied by a flag-bearer and about 200 soldiers with rifles, and clad in various kinds of uniforms, principally white with gay-colored sashes and turbans, and by a much larger following of archers and lancers, naked except for their quick-flashing, bright helmets. Everything about Amara was "spick and span," from his dark blue uniform of a Uganda rifleman to the European saddle upon his mule.

I received him with all the honors that I could command with my insignificant though trained escort, for it was deemed a great honor that he should pay me the first visit. His curiosity as to how I had come was too great, however, for him to wait until I called on him. It took him a long time to grasp the fact that we had not wandered either from Uganda or Egypt; and from the many questions he asked, it was apparent that the fact that we had come directly from the far east exercised a great moral influence over him, which I was pleased to think could not be otherwise than for the good of European interests on the upper Nile.

In return for the many presents which I made him, he gave me much durrha flour, honey, and ground nuts, but it was not until I had bidden him accept a large leopardine blanket that covered my bed that his heart really warmed towards me. I am sure he has never owned anything which pleases him more than this rug, which resembles the skin of some marvelous species of the cat family. Not only did the king at once send for an escort and guides for us, but he insisted on having a large tusk brought me from his village, to my regret, for I am afraid a poor native had some of his bones broken in consequence, if he did not fare worse. This man had made a mistake, and instead of bringing the tusk the king had ordered, he arrived at midnight with two ridiculously small cow tusks. Amara was so enraged that, picking up one of the latter, he began beating the wretched messenger in a terrible manner.

The smiling chief had suddenly turned into such a ferocious brute that when I endeavored to prevent his killing his subject, he at first turned upon me a pair of eyes so full of passion that I feared lest he might deal his next blow at me, but I pretended that I had only interrupted him to praise the two small tusks, with which "I would be delighted," etc., and thus managed to quiet him. The unconscious body of his victim was almost hurled out of camp, and others sent to bring the proper tusk, which did not arrive until two o'clock in the morning.

Amara was a splendid specimen of a Soudanese, over six feet in height, very broad and muscular, and with a strong, handsome face. But for his outburst of passion, which lasted but a minute, I should have thought him most cheerful and amiable.

Two long marches on March 3 and 4 brought us to a village where we were visited by a lady chieftain. I followed out my custom of offering a chair to a recognized chief, but I must confess the position was rather strange to me to be sitting with Mr. Frazer and a well-formed young lady clad in the same manner only as Gunga Din, and talking over weighty affairs involving the welfare of her subjects with the latter. Her name was Kari, but she behaved herself in such a dignified manner as to preclude any idea that she would have recognized a name such as Caroline.

The day after this we reached the village of the chief Oori Sube, the last of the villages under King Amara.

From here on until we reached Loker we found ourselves in territory belonging to the Lukoyu, who inhabit principally the hills to the south, and possess but a few scattered hamlets in the bushy, wild plain through which we passed. We had much difficulty in cutting our way through the low forests and dense bush, occasionally getting tangled up in bamboo jungles, which we here encountered for the first time.

I heard from Amara that there was an Englishman stationed on the east bank of the Nile, considerably south of Lado, so I abandoned my intention of going to the Belgians on account of the pleasure I felt it would give me to talk once more with an English officer, not dreaming that I could not enjoy the same benefit in the English Uganda Protectorate that all civilized countries extend to visitors—that of being able to leave my valuables in bond at a frontier post, if I did not intend to enter them in the country.

I firmly anticipated finding the Nile open, so that I could take my outfit to Cairo either in steamers or canoes. The first great disappointment came at Loker's, a large settlement situated almost on top of the long mountain which can be seen from the Nile 25 miles east of Fort Berkeley or Rejaf.

On reaching here on March 10 we were informed that no steamers had come up the Nile, and that, furthermore, there were no canoes to be had. We were all cut up by the news, for my transport had already given out, and I was obliged to leave thirteen loads with the chief Loker to hold until I sent back for them. However, we reached Fort Berkeley on March 14, 1900, and although I was much pained at the extortions which were enforced

upon me by the Government, according to the Uganda Protectorate regulations, I shall never regret having touched an English outpost, from the simple fact that I met Captain Wm. K. Dugmore of the Uganda Rifles, and remained with him as his guest for nearly seven weeks.

I only wish I could look upon some other officials with whom I came in contact at Aden and Berbera with nearly the same respect as I do my good friend and hospitable host at Fort Berkeley. Learning from despatches to Captain Dugmore, three months old, that "sudd" cutting had been begun on the Nile, I kept my men for nearly a month at the post, hoping that a steamer would come up the river and take us out *viâ* Omdurman. But on April 13 I found it necessary to send my assistant with all my men to Mombasa, except my cook and my bright Gurkha orderly, Hasap Singh. Famine was raging throughout the upper Nile districts, and had it not been for the great kindness of the Belgians in giving me grain, I could not have kept my men at all. I was obliged to remain longer myself, since I could get no transport for my collections and kit; and I had just made arrangements with the Belgians to go down the Congo, a journey of four months in the rains, to the west coast, when, to my joy, Major Peake turned up in a gunboat, after having cut through the "sudd," and most kindly took me away with him on May 5, on his homeward journey of 1,100 miles to Omdurman.

I reached Cairo the beginning of June, just ten months from the time of starting from the Somali coast for the interior, and a fortnight later found me in London with my collections safely installed at the British Museum of Natural History, to which I am presenting many of my specimens. The Academy of Natural Sciences of Philadelphia will also receive a large share. The collections include several hundred different species of birds, mammalia, plants, reptilia and batrachia, fishes, butterflies, etc., —a good number of them new to science.

I am much indebted to the Indian Survey Department for the loan of a valuable set of surveying instruments, by which I was enabled to lay down in detail over 500 miles of previously unmapped country between occasional known lines.

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The Lake Systems of Southern Patagonia.

BY

J. B. HATCHER,

Carnegie Museum.

Until recently, the interior of Patagonia has remained practically an unknown country. A few of the earlier travelers had, it is true, penetrated into the interior, but for the most part they followed one of two routes. Some chose the Santa Cruz river, which discharging into the Atlantic at about the fiftieth parallel of south latitude, forms an unbroken waterway, for vessels of light draft, from the sea to Lake Argentino at the base of the Andes, 150 miles to the westward. Others starting from the same point, selected a more northerly route, and after leaving the mouth of the Santa Cruz river, followed the old Indian trail that, for centuries, has formed the highway of communication between the southern Tehuelches and the Araucanians and other Indian tribes inhabiting the country watered by the Chubut, Negro, and Colorado rivers, far to the northward.

This trail, after leaving the Santa Cruz river near its mouth, assumes a northwesterly direction, and taking advantage of the valley of the Rio Chico which has cut a practical highway through the broad lava beds that cover most of the central plains of southern Patagonia, it ascends this stream to a point some 40 miles distant from the eastern base of the Andes. At this place a tributary valley enters the main river valley from the north. This valley connects with other similar lateral valleys tributary to the drainage systems lying to the northward and thus there is formed a continuous highway extending parallel with the base of the Andes from the Rio Chico to the Rio Negro.

The northern of these two routes was the one traversed by Lieutenant Musters more than thirty years ago; while the southern was chosen by Darwin, Moreno, and others. Few travelers diverged far from either of these natural highways, so that much of the interior of Patagonia remained a *terra incognita*

until quite recently. Within the last five years, however, our knowledge of the interior of this country has been very greatly increased. This has been accomplished chiefly by the explorations of the Argentine and Chilian boundary commissions, supplemented, perhaps, by the expeditions conducted by the present writer in southern Patagonia in behalf of Princeton University. To these explorations must be accredited the discovery of many new lakes, rivers, mountains, and other geographic features, as will at once become apparent by a comparison of the sketch map accompanying this paper with any of the older maps of the same region. This is especially true of that region lying between the Rio Santa Cruz and the forty-sixth parallel of south latitude.

It is not the purpose of the present paper to chronicle any of these discoveries, but rather to discuss the origin of some of the geographic features, and more especially of the lakes which, as will be seen by a glance at the accompanying map, constitute an important part of the physiography of this region.

The lakes of southern Patagonia may be divided according to their origin into three classes, viz.: *residual, glacial, and tectonic.* Of by far the greater importance are the lakes of tectonic origin. By referring to the map, an intricate series of lakes will be seen to extend in a line approximating that of the seventy-second meridian of west longitude throughout the entire length of the region under discussion. The exceedingly irregular outline of nearly all these bodies of water distinguishes them at once as true mountain lakes. Though the eastern extremities of many of them occupy lateral valleys that have been cut through the eastern range of the Andes and project well out into the great plain that extends from the mountains to the Atlantic, yet they one and all penetrate far to the westward, extending quite through the eastern foot-hills and sending out numerous arms and ramifications into that labyrinth of deep mountain gorges that separate the eastern lateral range of the southern Andes from the central and main range of the same mountain system.

Many of these lakes, like Argentino, Viedma, San Martin, Pueyrredon, and Buenos Aires, are of large size, 50 to 100 miles in length, or even longer. None of them have as yet been fully explored and accurately charted. All of them are, except on their eastern shores, surrounded by lofty, precipitous mountains. The

summits of the latter are covered with immense fields of snow and ice, from which descend glaciers that occasionally extend quite down the mountain slopes into the waters of the lakes. Huge blocks of ice are frequently detached from the front of such glaciers and float off into the lake as icebergs of no inconsiderable proportions.

The basins occupied by these lakes are largely of tectonic origin and they are chiefly due to the unequal folding of the strata that took place during the elevation of the southern Andes in late Tertiary times.*

With the exception of Lakes Viedma and Argentino, this great series of lakes all discharge their waters into the Pacific, notwithstanding the fact that they lie entirely to the eastward of the main range of the Andes, and that the eastern extremities of most of them project even into the great plain of eastern Patagonia.

Just to the eastward of this series of lakes of tectonic origin and situated on the plains, entirely without the foot-hills of the Andes, there is a second series of lakes evidently of glacial origin. For the most part these lakes are of small size and of minor importance, though some of them, like Lagoona Blanca, Lake Cardiel, and Lakes Colhue and Musters (the two latter are not shown on the accompanying map, since they lie somewhat beyond the forty-sixth parallel) are of considerable dimensions. These lakes have for the most part originated from the damming of preglacial drainage systems with glacial detritus during the recession of the glaciers that occupied these valleys at the close of the glacial period. Like the lakes just mentioned they contain fresh water. Although for the most part they have no surface outlet, the circulation permitted by the confining glacial drift is usually sufficient to keep the waters sweet, but a few of them do in very dry seasons become somewhat brackish.

Scattered all over the Patagonian plains from the Strait of Magellan to Bahia Blanca are great numbers of salt lakes. Such lakes are usually of quite limited area and of exceedingly shallow depth, though they occasionally attain to considerable dimensions. In reference to their origin I have called these salt lakes

* For a further discussion of the origin of these lakes, see "Some Geographic Features of Southern Patagonia, with a Discussion of their Origin," by J. B. Hatcher: Nat. Geogr. Mag., Vol. XI, pp. 41-55.

residual lakes. I have elsewhere advanced the theory that these lakes have resulted from confined bodies of water, cut off from the sea, during the process of elevation, which began at the close of the Tertiary and which resulted in the final recovery of this region from the ocean. I have held that the salt of these lakes has been derived directly from sea water and has not resulted by evaporation from the surface of an originally fresh-water lake with no outlet. No doubt some of the salt and other saline matter found in these lakes has been derived in this manner, but I believe that for the most part it has resulted directly from the evaporation of confined bodies of sea water. From the paleontologic and geologic evidences it is apparent that for a considerable period in late Tertiary times this region was elevated above the sea and subjected to erosion. During this period of late Tertiary elevation all the more important of the present drainage systems were outlined. Near the close of the Tertiary there was a subsidence just sufficient to permit the ingress of the sea. This submerged condition prevailed only for a relatively very short period, but sufficient for the deposition over the previously eroded surface of a thin layer of sedimentary rocks with characteristically marine fossils. At the close of the Tertiary a period of very gradual elevation set in, resulting in the final rescue of what is now southern Patagonia from the sea. As this land-mass gradually emerged, the higher table lands separating the previously eroded water courses would be the first to appear as islands and peninsulas separated by narrow channels and bays formed by the valleys of the drainage systems mentioned above. As the elevation continued the bottoms of such valleys would be successively brought above the water level and numerous small bays would be formed in all the smaller tributaries. Across the mouths of such bays bars would be thrown by the action of the tides. The formation of such bars, together with the gradual elevation constantly taking place, would tend to decrease the circulation between the waters of the bay and the ocean. By the combined action of these two agencies, the circulation would be more and more impeded until a stage would be reached in which this circulation would become intermittent. The two bodies of water would then be entirely separated, except during periods of unusually high tides, when the waters of the sea would rise sufficiently to overflow into the bay, or lake as it might now be more

properly termed. At first the obstruction would not be so great but that the bi-weekly high tides occurring with each full and new moon would produce a flow of water from the sea into the lake, thereby replenishing every two weeks the water lost by surface evaporation with a new supply of sea-water. After a time the obstruction would become so great that only the exceptionally high semi-annual tides would suffice for its submergence, and the replenishing of the waters of the lake would then occur only once every six months. After this a stage would be reached when ordinary spring tides would no longer suffice, and only an exceptionally high tide brought on by a continued strong easterly wind, acting in conjunction with the sun and moon at the period of spring tide, would pile up the waters of the sea sufficiently high to overflow the isthmus separating it from the lake. Such conditions would, of course, occur only at irregular intervals and would constantly become less and less frequent, until finally all communication would cease and the smaller body of water would become entirely separated as an inland salt lake, gradually diminishing in area after the last overflow, by evaporation from its surface until a point would be reached when the loss by evaporation would just balance the gain from tributary streams and springs, which latter, in the lakes in the region now being considered is exceedingly slight.

It was during these stages of intermittent communication that the salt deposits were formed. These deposits are now found, often covering the bottoms and adjacent shores of the lakes to a depth of several feet. During periods when communication between the lakes and the sea was suspended, the volume of water in the former would be greatly reduced by evaporation, thus increasing its salinity until an oversaturated solution would be attained, resulting in the precipitation of considerable quantities of salt. With the next ingress of the sea a fresh supply of salt would be introduced in solution, to be deposited in the same manner during the next period of suspended inter-communication. Such conditions, continued over a long period, have resulted in the deposition of the considerable bodies of salt now found in and about these lakes.

In the manner just described series of salt lakes were formed and may still be seen occupying slight depressions over the bot-

tons of all the abandoned water courses of Patagonia; while every stage in the process of the formation of such lakes may be observed in and about the heads of the different inlets all along the coast. Exceptional advantages for studying the origin of these salt lakes are offered at the head of the bay of San Julian and in the valley extending from the bay into the interior for a distance of 100 miles. In the bottom of this valley are numerous salt lakes, while in the region about the head of the bay there is a succession of lakes and inlets, showing every stage in the process of lake formation as detailed in the foregoing lines.

Dr. Otto Nordenskjold has taken exception to this theory of the origin of these salt lakes, holding that they are not residual lakes, and that the salt has not been derived directly from the sea as I have maintained. He holds that the salinity of these lakes is due to the fact that they have no outlets and that the salt has been derived, as in many other salt lakes in other countries, from the surrounding rocks by the tributary waters. To my mind there are two very conclusive arguments against this theory and in favor of that of considering these as residual lakes. *First:*—None of these lakes are fed by perennial streams, their supply of water being almost entirely limited to freshets due to occasional heavy showers and to melting snow in the immediate vicinity, so that it is entirely made up of surface water and necessarily contains very little, if any, saline material. *Second:*—Those lakes found nearest the coast and whose connection with the sea has only just recently been completely closed, are found to contain quite as important salt deposits as others situated many miles inland where the connection with the sea has long been severed; thus showing that the amount of salt in the latter has not been appreciably increased during the long period that has elapsed since their final severance. These facts, together with the observations made illustrating the method of formation of these lakes about the heads of many of the inlets of Patagonia, lead me unhesitatingly to pronounce them residual in origin, and as having derived the beds of salt found in and about them almost entirely from the sea direct.

Of the three systems of lakes described above, the first, or those of tectonic origin, are in point of size of vastly more importance than either of the other two. When Patagonia is finally

opened up to civilization and its many natural resources are fully recognized and taken advantage of, this superb series of magnificent mountain lakes will come to be more generally realized and appreciated. They will then, no doubt, achieve an importance and consideration commensurate with their exceptional size and beauty. Hitherto, owing to their inaccessibility, few indeed are those who have been enabled to see them; but, buried deep in the recesses of one of the most lofty and rugged mountain systems to be found anywhere on the surface of our earth, by those favored few they will ever be remembered as masterpieces of creative ingenuity. Extending from the barren lava beds and bleak, cheerless plains of the east through the forest-clad slopes of the foot-hills on into the remote and silent recesses of the central range of the Andes, whose summits, rising ever higher, are finally lost in immense fields of snow and ice, they present along their shores a greater variety of physiographic and geologic features than may be observed elsewhere in an equally limited area.

Of the three systems of lakes described above those of glacial origin are, perhaps, economically of the least importance of all. Yet, lying among the drumlins and terminal moraines of the ancient glaciers, where are now to be found the best pasture lands of the Patagonian plains region, they will become of ever-increasing importance as these lands are more and more occupied for pastoral purposes.

The salt from the residual lakes will always supply the local demand for that useful article and permit also of the annual exportation of considerable quantities.

PROCEEDINGS OF THE GEOGRAPHICAL SOCIETY OF PHILADELPHIA,

Session of 1899-1900.

1899.
Nov. 1st. Annual Meeting: The Proposed Anglo-German Exploration of the Antarctic, and Some Notes on the Seventh International Geographical Congress at Berlin.
President Henry G. Bryant.

Dec. 4th. Stated Meeting: Through the First Antarctic Night.
Frederick A. Cook, M. D.

Dec. 18th. Extra Meeting: Mexico: Including Ascents of Popocatapetl and Orizaba. Miss A. S. Peck.

1900.
Jan. 3d. Stated Meeting: An Excursion in Bosnia and Herzegovina.
Prof. W. M. Davis.

Jan. 17th. Extra Meeting. America in the Philippines and the Far East.
Hon. John Barrett.

Feb. 7th. Stated Meeting: Explorations in Patagonia.
Prof. W. B. Scott.

Feb. 21st. Extra Meeting: Climbs in the Canadian Rockies.
President Henry G. Bryant.

The Weather in the Light of Modern Meteorology.
Mr. Harvey M. Watts.

Mar. 7th. Stated Meeting: The Yosemite as a Piece of Structure and Scenery. An Autumn Study. Prof. Angelo Heilprin.

Apl. 4th. Stated Meeting: The Briton and the Boer. Reminiscences of South Africa. Dr. Edmund W. Holmes.

May 2d. Stated Meeting: Peary's Work in 1899 and 1900.
Mr. H. L. Bridgman, Secretary Peary Arctic Club.

May 12th. Annual Reunion and Garden Party: Flower Observatory, Upper Darby, 3 to 6 P. M., tendered by
President Henry G. Bryant.

INTER-MONTHLY MEETINGS.

1900.
Mar. 21st. The Ascent of Long's Peak, Colorado. Mr. Topliff Johnson.

The Effects of Tropical Climates on the Anglo-Saxon.
Mr. W. F. Biddle.

The Gold Sands of Cape Nome, Alaska.
Prof. Angelo Heilprin.

Into Peru and Bolivia. Mrs. William Elliott Barrows.

Apl. 25th. Methods and Ships for Polar Exploration.
Mr. Edwin S. Balch.

A Glimpse of the Great Canadian Falls near Emerald Lake.
Mr. Charles Roberts.

A Picture Journey to Niagara Falls and Gorge.
Miss Mary S. Holmes.

EDUCATIONAL LECTURE COURSE.

(Delivered under auspices of the Society.)

The Physical Features and Scenery of the North American Continent.
March 22d-April 9th. Seven Lectures. Prof. Angelo Heilprin.

Apl. 23d. The Relation Between the History and Physiography of North America. Dr. Talcott Williams.

Apl. 26th. The Native Tribes of North America. Dr. W. J. McGee.

THE

Geographical Society

OF

PHILADELPHIA

CHARTER, BY-LAWS
LIST OF MEMBERS

JANUARY, 1898

1520 CHESTNUT STREET,
PHILADELPHIA

PRESS OF
BILLSTEIN & SON,
PHILADELPHIA,
NEW YORK.

OFFICERS, 1897-98.

President,
PROF. ANGELO HEILPRIN.

Vice-Presidents,
MR. HENRY G. BRYANT. MR. CHARLES CHAUNCEY.

Corresponding Secretary,
MR. EDWIN SWIFT BALCH,
1412 Spruce st.

Recording Secretary,
DR. PAUL J. SARTAIN.

Treasurer,
MISS MARY BLAKISTON,
2042 Chestnut st.

BOARD OF DIRECTORS.

The Geographical Society of Philadelphia.

Organized as the Geographical Club of Philadelphia.

HISTORY.

The inception of the Geographical Society of Philadelphia is found in a call for the organization of such association, bearing date of March 10, 1891.

A preliminary meeting of organization was held in the Academy of Natural Sciences on March 19th. It was then recommended that a Constitution and By-Laws be drafted for presentation at the next meeting.

On the 30th of the same month, in the hall of the Academy of Natural Sciences, on Logan Square, a preliminary meeting for the purpose of framing articles of association was held, and the following gentlemen who had responded to the call were present:

Dr. J. T. Rothrock, Mr. Edward H. Weil, Mr. Simon A. Stern, Mr. Roberts Le Boutillier, Dr. Samuel G. Dixon, Mr. Benjamin Smith Lyman, Dr. Henry Skinner, Prof. Angelo Heilprin and Dr. Benjamin Sharp.

At this meeting Professor Heilprin was asked to take the chair, and Dr. Sharp acted as Secretary. Provisional articles of association were submitted.

At a meeting held on April 20th, in the hall of the Academy of Natural Sciences, at which the following members were present: Dr. Edward J. Nolan, Mr. Edmund Stirling, Mrs. Sarah C. F. Hallowell, Miss Jean Fraley Hallowell, Mr. and Mrs. Coleman Sellers, Jr., Dr. Henry C. McCook, Dr. D. G. Brinton, Mr. Edward H. Weil, Mr. William Righter Fisher, Dr. Henry Skinner, Mr. Benjamin Smith Lyman, Dr. Charles L. Mitchell, Prof. Angelo Heilprin, Miss Frances May Bockius, Miss Bessie G. Bockius and Dr. Benjamin Sharp, the articles of association framed at the last meeting were formally adopted, and Prof. Angelo Heilprin was elected President.

The broad purposes of the organization rapidly attracted to it the interest of the community, and before the close of November,

1891, 104 names had already been enrolled for membership. The first stated meeting was held in the new lecture-hall of the Academy of Natural Sciences, on February 24, 1892, when the President read an opening address on the "Present Aspects of Geographical Study." Other addresses were delivered by Vice-President Edward H. Weil and by Dr. D. G. Brinton ("On the Relations of Earth to Man"). The stated and special meetings up to this date have been as follows:

April 6, 1892. Address by Mr. Henry Pettit: "Views of Nature in the Occident and in the Orient."

May 4, 1892. Address by Dr. Charles L. Mitchell: "The Geographical Aspects of Western Norway."

November 2, 1892. Address by President Heilprin: "The Arctic Problem and the Recent Explorations."

December 8, 1892. Address by Mr. E. S. Balch: "Mountain Exploration."

January 4, 1893. Address by Miss Laura Bell: "Characteristics of Constantinople."

February 1, 1893. Address by Mr. W. W. Rockhill: "Through Mongolia and Tibet."

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January 3, 1894. Address by Dr. Benjamin Sharp: "Two Months in Hawaii."

February 7, 1894. Addresses by Mr. Edwin Swift Balch: "The Japanese and their Painting;" Mr. F. Lynwood Garrison: "Geographical Distribution of Moose and Caribou in North America."

March 7, 1894. Addresses by Dr. F. A. Cook: "Shall the Antarctic Regions Remain a Blank upon our Charts?"; Mr. Walter Wellman: "The Proposed Wellman Arctic Expedition of 1894."

April 4, 1894. Addresses by Prof. E. H. Williams, Jr.: "Lake Packer, Pennsylvania: An Episode in the Early Part of the Glacial Period;" Prof. Angelo Heilprin: "The Gorges and Waterfalls of Northeastern Pennsylvania."

May 2, 1894. Address by Mr. Sidney Dickinson, M. A., F. R. G. S.: "Picturesque New Zealand."

November 7, 1894. Address by Mr. Henry G. Bryant: "Preliminary Report on the Operations of the Peary Auxiliary Expedition of 1894."

December 5, 1894. Annual Address by the President, Prof. Angelo Heilprin: "The Progress of Discovery and the Lands of Promise to the Explorer."

January 2, 1895. Addresses by Mr. Talcott Williams: "The Mountains of North Carolina;" Mr. Thomas Willing Balch: "Some Facts about Alsace-Lorraine;" Dr. Henry Skinner: "Summering in the Maine Woods;" Mr. Henry C. Mercer: "Cave-Hunting in Pennsylvania."

February 6, 1895. Address by Dr. Emil Holub: "Experiences and Adventures in a Journey in South Africa."

March 6, 1895. Address by Mr. William E. Wood: "An Evening in Alaska and Norway."

April 3, 1895. Address by Gen. A. W. Greely: "The Oregon Trail, or the Exploration of Captain Bonneville."

May 1, 1895. Address by Mr. Thomas G. Allen, Jr.: "An Ascent of Mount Ararat."

November 6, 1895. Annual Address by the President, Mr. Edwin Swift Balch: "The Present Geographical Movement."

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January 3, 1894. Address by Dr. Benjamin Sharp: "Two Months in Hawaii."

March 3, 1897. Address by Mr. S. Hudson Chapman: "Greece and the Ægean Islands."

April 7, 1897. Address by Mr. George C. Thomas: "A Visit to Norway, the North Cape and Spitzbergen in the Summer of 1896."

April 21, 1897. Address by Dr. H. M. Hiller: "Borneo and its Inhabitants."

May 5, 1897. Address by Mr. Cyrus C. Adams: "Recent Discoveries in Africa."

November 3, 1897. Address by Mr. Henry G. Bryant: "Mountaineering in Alaska, including a Journey over Chilkoot Pass."

December 1, 1897. Address by Prof. Angelo Heilprin: "Mexico: Aspects of Nature in New Spain."

By a vote of the Club (at a meeting held December 2, 1896), acting on the recommendation of the Board of Directors, it was resolved to change the name of the organization into The Geographical Society of Philadelphia; the application for such change was granted by the Court of Common Pleas of Philadelphia, April 8, 1897.

As past history of the Society to the present date should be mentioned its association, through a generous contribution of funds, with the Peary Arctic Expedition of 1893 and the Peary Auxiliary Expedition of 1894, and the issue of the following Club "Bulletins":

"Mountain Exploration," by Mr. Edwin Swift Balch; "A Journey to the Grand Falls of Labrador," by Mr. Henry G. Bryant; "The Progress of Discovery and the Lands of Promise to the Explorer," by Prof. Angelo Heilprin; "Some Facts about Alsace-Lorraine," by Mr. Thomas Willing Balch; "The Peary Auxiliary Expedition of 1894," by Mr. Henry G. Bryant; "A Trip to Manika Land," by Mr. J. Edward Farnum; "Venezuela's Territorial Claims" and "Notes on the Schomburgk Line and the Guayana Boundary," by Mr. Joseph B. Austin and Prof. Angelo Heilprin; "The Arctic Regions (map)," by Prof. Angelo Heilprin.

On February 2, 1896, the Haseltine Building, in which the Society had secured a room for use as a library, was destroyed by fire, and by it the Society lost its full possessions, including its books, the Charter, Bulletins and exchanges.

December 4, 1895. Address by Mr. Henry C. Mercer: "Cave Exploration in Yucatan."

January 8, 1896. Address by Civil Engineer Robert E. Peary, U. S. N.: "From Whale Sound to Independence Bay across the Great Ice."

February 5, 1896. Addresses by Mr. J. Edward Farnum: "A Trip to Manika Land, Southeast Africa;" Mr. Theodore Le Boutillier: "With the Peary Relief Party to Bowdoin Bay."

March 7, 1896. Address by Dr. A. Donaldson Smith: "Explorations in Unknown East Africa, from Somaliland to Lake Rudolf."

April 1, 1896. Addresses by Mr. Joseph B. Austin: "The Orinoco Country and El Dorado;" Prof. Angelo Heilprin: "The Schomburgk Line."

April 15, 1896. Address by Mr. Joseph Wharton: "Volcanoes and the Eruption of Krakatoa."

May 6, 1896. Addresses and papers by Dr. Daniel G. Brinton: "The Rhine Delta; Mr. Arthur C. Denniston: "A Winter Ascent of Mount Katahdin;" Miss Mary S. Holmes: "In the Neighborhood of Philadelphia."

November 4, 1896. Annual Address by the President, Prof. Angelo Heilprin: "Hungary and its People—a Pictorial Study and the Progress of a Nation."

December 2, 1896. Addresses by Mr. Henry G. Bryant, Mr. Amos Bonsall and Prof. Angelo Heilprin: "An Analysis of Nansen's Journey;" Dr. Henry Skinner: "Exhibition of Photographs of Roan and Grandfather Mountains and the Doe River Gorge, North Carolina."

January 6, 1897. Address by Mrs. Mabel Loomis Todd: "In Ainu Land with an Eclipse Expedition."

February 3, 1897. Address by Prof. Angelo Heilprin: "Across the Atlas Mountains and into the Sahara."

February 19, 1897. Address by Mr. Rudolph Blankenburg: "Japan and her People—personal observations."

March 3, 1897. Address by Mr. S. Hudson Chapman: "Greece and the Ægean Islands."

April 7, 1897. Address by Mr. George C. Thomas: "A Visit to Norway, the North Cape and Spitzbergen in the Summer of 1896."

April 21, 1897. Address by Dr. H. M. Hiller: "Borneo and its Inhabitants."

May 5, 1897. Address by Mr. Cyrus C. Adams: "Recent Discoveries in Africa."

November 3, 1897. Address by Mr. Henry G. Bryant: "Mountaineering in Alaska, including a Journey over Chilkoot Pass."

December 1, 1897. Address by Prof. Angelo Heilprin: "Mexico: Aspects of Nature in New Spain."

By a vote of the Club (at a meeting held December 2, 1896), acting on the recommendation of the Board of Directors, it was resolved to change the name of the organization into The Geographical Society of Philadelphia; the application for such change was granted by the Court of Common Pleas of Philadelphia, April 8, 1897.

As past history of the Society to the present date should be mentioned its association, through a generous contribution of funds, with the Peary Arctic Expedition of 1893 and the Peary Auxiliary Expedition of 1894, and the issue of the following Club "Bulletins":

"Mountain Exploration," by Mr. Edwin Swift Balch; "A Journey to the Grand Falls of Labrador," by Mr. Henry G. Bryant; "The Progress of Discovery and the Lands of Promise to the Explorer," by Prof. Angelo Heilprin; "Some Facts about Alsace-Lorraine," by Mr. Thomas Willing Balch; "The Peary Auxiliary Expedition of 1894," by Mr. Henry G. Bryant; "A Trip to Manika Land," by Mr. J. Edward Farnum; "Venezuela's Territorial Claims" and "Notes on the Schomburgk Line and the Guayana Boundary," by Mr. Joseph B. Austin and Prof. Angelo Heilprin; "The Arctic Regions (map)," by Prof. Angelo Heilprin.

On February 2, 1896, the Haseltine Building, in which the Society had secured a room for use as a library, was destroyed by fire, and by it the Society lost its full possessions, including its books, the Charter, Bulletins and exchanges.

CHARTER

OF THE

Geographical Club (Society) of Philadelphia.

BE IT KNOWN THAT, The subscribers, having associated themselves for the purpose of organizing the GEOGRAPHICAL CLUB OF PHILADELPHIA, and being desirous of becoming incorporated agreeably to the provisions of an Act of the General Assembly of the Commonwealth of Pennsylvania, entitled "An Act to provide for the Incorporation and Regulation of certain Corporations," approved the twenty-ninth day of April, A. D. 1874, and its supplements, do hereby declare and certify that the following are the purposes, objects, articles and conditions of their said association, for and upon which they desire to be incorporated:

I. The name of the proposed corporation is GEOGRAPHICAL CLUB OF PHILADELPHIA.

II. The purpose for which the corporation is formed is the advancement of the science of geography and of geographical studies and exploration, the recording of discoveries, the presentation of researches, and the accumulation of works on geography.

III. The place where the business of the corporation is to be transacted is the city of Philadelphia, State of Pennsylvania.

IV. The corporation is to exist perpetually.

V. The names and residences of the subscribers are as follows: Angelo Heilprin, 1417 North Sixteenth Street, Philadelphia; Edward H. Weil, 1720 Pine Street, Philadelphia; Edward H. Williams, Rosemont, Pa.; Henry G. Bryant, 2013 Walnut Street, Philadelphia; Mary Wager Fisher, Bryn Mawr, Pa.; F. Lynwood Garrison, Radnor, Pa.; Sarah C. F. Hallowell, 2017 DeLancey Place, Philadelphia; Daniel G. Brinton, 2041 Chestnut Street, Philadelphia; Edwin Swift Balch, 1412 Spruce Street, Philadelphia; Coleman Sellers, Jr., 410 North Thirty-third Street, Philadelphia; Anna Williams Dreer, 101 North Thirty-third Street, Philadelphia; George Gluyas Mercer, 641 North Sixteenth Street, Philadelphia; Frances May Bockius, 1901 North Logan Square, Philadelphia; Martha Bunting, 2000 Arch Street, Philadelphia; Mary Blakiston, 2042 Chestnut Street, Philadelphia; Gavin W. Hart, 1316 Spring Garden Street, Philadelphia; Benjamin Smith Lyman, 708 Locust Street, Philadelphia; Thomas Meehan, Chew Street, Germantown, Philadelphia; Edward J. Nolan, 825 North Twentieth Street, Philadelphia; Robert E. Peary, Washington, D. C.; Benjamin Sharp, 317 North

Thirty-fifth Street, Philadelphia; Henry Skinner, 716 North Twentieth Street, Philadelphia; Albert B. Weimer, 1934 Wallace Street, Philadelphia.

VI. The officers of the corporation shall be a President, a First and Second Vice-President, a Recording Secretary, a Corresponding Secretary and a Treasurer, who, together with seven Directors, shall form the Board of Directors, to which shall be entrusted the management of the affairs of the corporation. The names of those chosen Directors for the first year are: Angelo Heilprin, President, 1417 North Sixteenth Street, Philadelphia; Edward H. Weil, First Vice-President, 1720 Pine Street, Philadelphia; Edward H. Williams, Second Vice-President, Rosemont, Pa.; Henry G. Bryant, Recording Secretary, 2013 Walnut Street, Philadelphia; Mary Wager Fisher, Corresponding Secretary, Bryn Mawr, Pa.; F. Lynwood Garrison, Treasurer, Radnor, Pa.; Edwin Swift Balch, 1412 Spruce Street, Philadelphia; Daniel G. Brinton, 2041 Chestnut Street, Philadelphia; Anna Williams Dreer, 101 North Thirty-third Street, Philadelphia; Sarah C. F. Hallowell, 2017 DeLancey Place, Philadelphia; Coleman Sellers, Jr., 410 North Thirty-third Street, Philadelphia; Mary Blakiston, 2042 Chestnut Street, Philadelphia; Albert B. Weimer, 1934 Wallace Street, Philadelphia.

VII. The corporation has no capital stock.

VIII. The yearly income from said corporation, other than that derived from real estate, will not exceed the sum of $50,000.

WITNESS our hands and seals this tenth day of April, Anno Domini One Thousand and Eight Hundred and Ninety-three.

ANGELO HEILPRIN,	[Seal]
EDWARD H. WEIL,	[Seal]
EDWARD H. WILLIAMS,	[Seal]
HENRY G. BRYANT,	[Seal]
ALBERT B. WEIMER,	[Seal]
F. LYNWOOD GARRISON,	[Seal]
GEORGE GLUYAS MERCER,	[Seal]
FRANCES MAY BOCKIUS,	[Seal]
MARTHA BUNTING,	[Seal]
MARY BLAKISTON,	[Seal]
GAVIN W. HART,	[Seal]
SARAH C. F. HALLOWELL,	[Seal]
D. G. BRINTON,	[Seal]
EDWIN SWIFT BALCH,	[Seal]
COLEMAN SELLERS, JR.,	[Seal]
MARY WAGER FISHER,	[Seal]
ANNA WILLIAMS DREER,	[Seal]
BENJ. SMITH LYMAN,	[Seal]
THOMAS MEEHAN,	[Seal]
EDW. J. NOLAN,	[Seal]
R. E. PEARY,	[Seal]
BENJ. SHARP,	[Seal]
HENRY SKINNER.	[Seal]

COMMONWEALTH OF PENNSYLVANIA, } ss:
COUNTY OF PHILADELPHIA.

Before me, the subscriber, a Notary Public of the Commonwealth of Pennsylvania, residing in the city of Philadelphia, personally appeared Angelo Heilprin, Gavin W. Hart and George Gluyas Mercer, three of the subscribers to the foregoing certificate of incorporation, and in due form of law acknowledged the same to be their act and deed.

WITNESS my hand and official seal this tenth day of April, Anno Domini One Thousand Eight Hundred and Ninety-three.

[SEAL.] ALEXANDER DURBIN LAUER,
Notary Public.

COUNTY OF PHILADELPHIA, *ss:*

Filed in the Prothonotary's Office of the Court of Common Pleas, in and for said county, this tenth day of April, A. D. 1893.

C. P. No. 1, Mar. Term, 1893, No. 524.

WILLIAM B. MANN,
Prothonotary.

DECREE.

And now, this twenty-ninth day of April, A. D. 1893, the within Charter and Certificate of Incorporation, having been presented to me, a Law Judge of said county, accompanied by due proof of publication of the notice of this application, as required by the Act of Assembly and rule of Court in such case made and provided, I certify that I have examined and perused the said writing, and have found the same to be in proper form and within the purposes named in the first clause specified in Section Second of the Act of the General Assembly of the Commonwealth of Pennsylvania, entitled "An Act to provide for the Incorporation and Regulation of certain Corporations," approved April 29, A. D. 1874, and the supplements thereto, and the same appearing to be lawful and not injurious to the community, I do hereby, on motion of George Gluyas Mercer, Esquire, on behalf of the petitioners, order and decree that the Charter aforesaid be and the same is hereby approved, and that, upon the recording of the same and of this order, the subscribers thereto and their associates shall be a corporation by the name of GEOGRAPHICAL CLUB OF PHILADELPHIA, for the purposes and upon the terms therein stated.

F. AMEDEE BREGY,
Judge of Court of Common Pleas No. 1.

Recorded in the office for the Recording of Deeds, etc., in and for the County of Philadelphia, in Charter Book No. 19, page 302, etc.

WITNESS my hand and seal of office, this tenth day of November, A. D. 1893.

THOMAS GREEN,
Recorder of Deeds.

Geographical Society of Philadelphia.

BY-LAWS.

ARTICLE I.

OBJECTS.

The objects of the Society are:

(1) The furtherance of the Science of Geography and the promotion of geographical studies generally.

(2) The interchange of experiences of travel at home and abroad.

(3) The recording of discoveries, and the presentation of researches by means of lectures, photographic and other exhibitions.

(4) The promotion of geographical exploration.

(5) The accumulation of works on geography and photographs of scenery and people.

ARTICLE II.

MEMBERSHIP.

There shall be four classes of membership:

(1) ACTIVE OR RESIDENT MEMBERS, who shall pay annual dues as fixed by the Board of Directors, and shall alone have the privileges of voting and holding office.

(2) NON-RESIDENT MEMBERS, who are those living more than seventy-five miles from Philadelphia. They shall pay one-half the annual dues, and shall be entitled to attend the Society meetings and to receive its publications. They may assume the privileges of Active members at any time on payment of full annual dues.

(3) CORRESPONDING MEMBERS, who may be chosen from the officers of other geographical or scientific societies and from those who have contributed to geographical knowledge, or are engaged in geographical exploration or other correlated scientific work.

(4) HONORARY MEMBERS. Only those who have distinguished themselves in the field of geographical knowledge or exploration shall be eligible to Honorary membership. The number of Honorary members shall not exceed twenty-five at any one time.

Corresponding and Honorary members shall be exempt from the payment of dues and shall have all the privileges of other members except those of voting and holding office.

Nominations for Active and for Non-resident membership shall be made by one member and seconded by two other members having personal knowledge of the nominee, whose qualifications for membership and sym-

the said corporation to the intent and purposes therein mentioned, and that the name of the deponent subscribed thereto as President of the said corporation, in attestation of the due execution and delivery of the said petition, is of the deponent's own proper handwriting.

Affirmed and subscribed before me the day and year above named.

[Seal] (Signed) GEO. E. NITZSCHE,
Notary Public.

DECREE.

And now, March 6, 1897, the within petition having been presented and read, and it appearing to the Court that the alteration and amendment, as therein prayed for, is lawful and beneficial, and not in conflict with the requirements of the Constitution or laws of this Commonwealth, it is therefore ordered that notice of the pending application be given, according to the provisions of the Acts of the General Assembly of the Commonwealth of Pennsylvania in such case made and provided.

By the Court:

(Signed) SAML. W. PENNYPACKER,
President Judge.

Geographical Society of Philadelphia.

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pathy with the objects of the Society, as enumerated under Article I, must be stated in writing to the Board of Directors, who shall have the power to act on such nominations.

Corresponding and Honorary members may be elected by the unanimous vote of the Directors present at any Board meeting.

The annual dues shall be fixed by the Board of Directors, and shall not exceed $5, payable on or before the first day of January in each year. Members elected at the May and October meetings shall be assessed one-half the amount of the annual dues. Members elected in November and December shall not be assessed for dues until the January first following their election. Members whose dues are unpaid on April 1st shall be notified by the Treasurer, and any member in arrears six months after such notification may be suspended or dropped by the Board of Directors.

Any member or member-elect may become a Life member by the payment of fifty dollars, and in such case shall not be liable for further dues, and shall have the privileges and rights of an Active member. All payments for Life membership shall be invested to form a fund whose annual income shall be used for such purposes as the Society may hereafter direct.

ARTICLE III.

SOCIETY MEETINGS.

The Annual Meeting of the Society shall be held on the evening of the first Wednesday in November, at which meeting the President shall deliver an address on the progress of geographical discovery during the year, either general or special, or relating to special researches made in connection with geographical inquiry.

The other regular meetings of the Society shall be held monthly, on the evenings of the first Wednesday of each month from November to May, inclusive, unless otherwise ordered by the Board of Directors.

Each member shall be provided with a membership card, and the Resident members, in addition, with two invitation cards for each meeting, each card admitting but one person. It shall be within the discretion of the Board of Directors to issue additional cards, or to withhold, on special occasions, the supplemental cards. No person shall be admitted without a card, unless personally known to the attendant as a member.

Special meetings of the Society may be called by the Board at its discretion, and shall be called upon the written request of four members of the Board, addressed to the President. The proceedings of the Board of Directors shall be reported monthly to the Society.

ARTICLE IV.

BOARD MEETINGS.

Meetings of the Board of Directors for general business shall be held in each month from October to May, inclusive, on such day as the Board shall from time to time appoint and announce to the Society. Special meetings of

the Board may be called by the President at his discretion and shall be called by him at the written request of four members of the Board.

At all meetings of the Board seven members present shall constitute a quorum for the transaction of business.

Members of the Board of Directors who have absented themselves from three consecutive stated meetings of the Board without the presentation of excuse for such absence, shall be considered to have forfeited their seats, and the places so left vacant shall be filled (by appointment) by the Board of Directors.

ARTICLE V.

ANNUAL ELECTIONS.

The Annual Election shall take place at the regular May meeting, when there shall be elected:

(1.) The President, Vice-Presidents, Secretaries and Treasurer for the ensuing year.

(2.) Three Directors, of whom two shall serve for two years and one for three years, the long term to be drawn by lot after the election.

(3.) Four members of the Excursion Committee and four members of the Reception Committee for the ensuing year.

No person shall be eligible for the office of President or for the office of Vice-President for more than two consecutive years, nor shall Directors, elected as such, be eligible for consecutive terms of such service.

A Nominating Committee, to consist of five members of the Society, shall be appointed by the President at the March meeting of the Society, which committee shall report to the Society at its regular April meeting their nomination for Officers, Directors and Standing Committees of the Society; at which meeting also any five members may unite in presenting in writing an additional nomination for any office, provided such nominee has consented to serve, if elected; or may within one week after the April meeting send such nomination to the Recording Secretary by mail.

The election shall be by secret ballot, after the Australian method, on tickets furnished by the Board of Directors, containing in alphabetical order the names of all persons nominated for the respective offices, and having a blank space where the voter may write the name of any one not nominated for whom he may wish to vote. Each member shall mark his ticket with a cross (X) opposite the name of the person he desires to vote for. If a voter marks more names than there are persons to be elected to an office, or if, for any other reason, it is impossible to determine the voter's choice, his ballot shall not be counted for such office.

No member shall have the right to vote whose dues are in arrears at the time of the annual election.

ARTICLE VI.

COMMITTEES.

The President shall, at the April meeting of the Society, appoint an Auditing Committee, consisting of two Society members, whose duty it shall be to examine the Treasurer's accounts, determine their correctness and certify the same to the Society at its May meeting.

There shall be Standing Committees of the Society on Excursions and on Receptions, each consisting of four members elected by the Society and a Chairman appointed from the Board of Directors by the President.

The Standing Committees of the Board of Directors shall be :

(1) The Executive Committee.

(2) The Finance Committee.

(3) The Entertainment Committee.

(4) The Publication Committee.

The Executive Committee shall consist of the President, the two Vice-Presidents and the two Secretaries, whose duty it shall be to arrange for the stated meetings of the Society, and to prepare suitable programs for presentation at them.

The Finance Committee shall consist of three members, and shall have a general oversight of the receipts, expenditures and investments of the Society, and shall, before the October and February stated meetings of the Board, examine and certify the Treasurer's accounts and vouchers, and report to the Board at the said meetings the result of their examination and the amount of the cash balance in the Treasurer's hands.

The Entertainment Committee shall consist of at least three members, and shall include the ladies who may be members of the Board of Directors.

The Publication Committee shall consist of at least three members.

All necessary appointments to the Standing Committees shall be made by the President at the stated meeting of the Board in May.

Additional Standing Committees may be constituted hereafter by either the Society or the Board of Directors, as may be found expedient by them respectively.

ARTICLE VII.

PUBLICATIONS, PROFESSORSHIPS AND MEDAL.

The publications of the Society shall be known as the BULLETIN OF THE GEOGRAPHICAL SOCIETY OF PHILADELPHIA, and shall contain matter referring only to geographical knowledge, or that which is pertinent to the interests of the Society. It shall be under the direction of the Publication Committee.

The Board of Directors shall have the power to create Honorary Professorships of Political and Historical Geography ; Physical and Descriptive Geography ; Anthropo-Geography ; Military and Naval Geography ; and Cartographical and Topographical Geography.

A medal, to be known as the Elisha Kent Kane Medal of the Geographical Society of Philadelphia, may be awarded annually by the Society, on the recommendation of the Board of Directors, to such person as may be designated by a three-fourths vote of the entire Board of Directors, and approved by the majority of the members present at the meeting, and only for important geographical exploration or research made during the twenty-four months preceding the award. The award shall be made at the May meeting of the Society.

ARTICLE VIII.

AMENDMENTS.

These By-Laws may be amended by the affirmative vote of two-thirds of the members present at any meeting, provided that notice of the intended amendment, with a copy of the proposed amendment, shall have been given at a previous monthly meeting.

HONORARY MEMBERS.

*Astrup, Mr. Eivind,
Christiania, Norway.
Daly, Hon. Charles P.,
84 Clinton Place, New York, N. Y.
Dawson, Dr. Geo. M., C.M.G., F.R.S.,
Director of the Geological Survey of Canada,
Ottawa, Canada.
Fielde, Miss Adele M.,
18 West 43d Street,
New York, N. Y.
Greely, General A. W.,
Chief Signal Officer, U. S. A.,
Washington, D. C.
Holub, Dr. Emil,
Vienna, Austria.
Levasseur, Prof. E.,
Membre de l'Institut,
Paris, France.
Markham, Sir Clements R., K. C. B.,
F. R. S., P. R. G. S.,
London, England.
Melville, Commodore Geo. W.,
Engineer in Chief, U. S. N.,
Washington, D. C.
Nansen, Dr. Fridtjof,
Christiania, Norway.
Peary, Lieut. Robt. E.,
Civil Engineer, U. S. N.,
Brooklyn, N. Y.
Peary, Mrs. Robt. E.,
Brooklyn, N. Y.
Richthofen, Baron F. von,
Berlin, Germany.
Rockhill, Hon. William Woodville,
Athens, Greece.
Suess, Prof. Eduard,
Vienna, Austria.

*Deceased, Dec., 1895.

CORRESPONDING MEMBERS.

Abbott, Mr. W. L.
Davis, Prof. Wm. M.,
Cambridge, Mass.
Fay, Prof. Charles E.,
Tufts College, Mass.
Gannett, Mr. Henry,
U. S. Geological Survey,
Washington, D. C.
Plummer, Mr. Fred G.,
Tacoma, Washington.
Russell, Prof. Israel C.,
University of Michigan,
Ann Arbor, Mich.
Sella, Sig. Vittorio,
Biella, Italy.

ACTIVE MEMBERS.

Aaron, Mrs. C. B.,
702 North 43d st.
Abbott, Mr. Francis R.,
1509 Locust st.
Adaire, Mrs. Alexander,
1414 Palmer st.
Allen, Mr. Samuel E. S.,
Holmesburg, Phila.
Allen, Mr. Thomas G., Jr.,
Haddonfield, N. J.
Armstrong, Mr. Theodore,
115 Chestnut st.
Ayer, Miss Mabel,
2348 St. Albans pl.

Bache, Mr. Richard Meade,
4400 Sansom st.
Bacon, Mrs. Josiah M.,
919 Clinton st.
Balch, Miss Elise Willing (life mem.),
1412 Spruce st.
Balch, Mr. Edwin Swift (life mem.),
1412 Spruce st.
Balch, Mr. Thomas Willing (life mem.),
1412 Spruce st.
Baldwin, Miss Anna,
Bryn Mawr, Pa.
Baldwin, Mr. E. B. (non-res.),
Planters House,
411 Levee st., Cairo, Ill.
Baltz, Mr. Harry R.,
1813 Pine st.
Barker, Miss Dency M.,
S. E. cor. 16th and Wallace sts.
Barker, Mr. Edward D.,
808 North 41st st.
Barker, Miss Mary,
4300 Spruce st.
Barlow, Mr. Thos. W.,
1012 Girard Building.
Barrows, Mrs. Wm. Elliot,
2312 Spruce st.
Baugh, Mr. Daniel,
1601 Locust st.
Beaux, Miss Cecilia,
4305 Spruce st.
Bell, Miss Emily,
1428 Spruce st.
Bell, Miss Laura,
1428 Spruce st.
Biddle, Mr. Wm. F.,
4305 Spruce st.
Bissey, Mrs. Herman S.,
1630 North 16th st.
Blakiston, Miss Maria S.,
3214 Woodland ave.
Blakiston, Miss Mary,
2042 Chestnut st.
Bockius, Miss Bessie,
151 North 18th st.
Bockius, Miss Frances May,
151 North 18th st.
Bonsall, Mr. Amos,
906 Walnut st.
Borden, Mr. H. Clay,
2030 Cherry st.
Bowman, Miss Anne S.,
232 School lane, Germantown.
Boyer, Mr. Chas. S.,
3223 Clifford st.
Bradford, Dr. T. Hewson,
125 South 18th st.
Breed, Mr. J. Howard,
7 South 21st st.
Brinton, Dr. Daniel G.,
346 Washington st., Media, Pa.
Brodhead, Mr. L. W. (non-res.),
Delaware Water Gap, Pa.
Brodhead, Mrs. L. W. (non-res.),
Delaware Water Gap, Pa.

Brown, Miss Martha M. (life mem.),
1716 Walnut st.
Brinley, Mr. Chas. A.,
247 South 16th st.
Bryant, Mr. Henry G.,
2013 Walnut st.
Buckingham, Mr. Burnett,
Chestnut Hill, Phila.
Bunting, Miss Martha,
Girls' High School, Phila.
Burdette, Mr. Robert J.,
Bryn Mawr, Pa.

Campbell, Miss Mary A.,
405 School lane, Germantown.
Chahoon, Mr. Jos. S.,
126 South 4th st.
Chahoon, Mrs. Jos. S.,
126 South 4th st.
Chandler, Mr. Alfred N.,
The Bourse, 5th st. front.
Chapman, Mr. S. Hudson,
1348 Pine st.
Chauncey, Mr. Charles,
251 South 4th st.
Clements, Mr. Alfred,
1624 Chestnut st.
Cliff, Prof. George H.,
1507 North 17th st.
Colket, Mr. C. Howard (life mem.),
519 Drexel Building.
Colket, Mrs. C. Howard,
519 Drexel Building.
Converse, Mr. John H.,
Rosemont, Pa.
Converse, Mrs. John H.,
Rosemont, Pa.
Cook, Mr. E. S.,
809 North 24th st.
Cordery, Miss Deborah Leeds,
2119 North 15th st.
Cox, Mr. John Lyman,
2218 St. James pl.
Cox, Miss Mary,
1302 Pine st.
Cramp, Mr. Charles H.,
507 South Broad st.
Cramp, Mr. Samuel H.,
1229 North Broad st.
Craven, Miss Laura,
2019 Columbia ave.
Culin, Mr. Stewart,
University of Pennsylvania.
Cushman, Miss Ida,
1340 Walnut st.

Dallam, Mr. David E.,
N. E. cor. 7th and Walnut sts.
Davis, Mrs. E. Irene C.,
615 North 32d st.
Davis, Mr. Frank A.,
615 North 32d st.
Day, Mr. Frank Miles,
925 Chestnut st.
Day, Mrs. Frank Miles,
Phil-ellena st., near Green,
Germantown.
Denniston, Mr. Arthur C.,
Bullitt Building.
Dickinson, Mr. Sidney,
441 Chestnut st.
Donaldson, Mr. Francis Adams, Jr.,
4307 Spruce st.
Dorey, Mr. Wm. H.,
235 Race st.
Dornan, Mr. Robt.,
1505 North 16th st.
Dornan, Mrs. Robt.,
1505 North 16th st.
Douredoure, Mr. Bernard L.,
2203 Spring Garden st.
Douredoure, Miss Eveleen,
2203 Spring Garden st.
Dreer, Mr. Wm. F.,
714 Chestnut st.
Dreer, Mrs. Wm. F.,
714 Chestnut st.
Dunning, Dr. T. S.,
1328 North 15th st.

Eldridge, Mrs. S. Morgan,
1337 North Broad st.
Ellis, Mr. Joseph D.,
325 Walnut st.

Entrikin, Mr. Samuel J. (non-res.),
219 Chattanooga st.,
San Francisco, Cal.
Erben, Miss Helen,
"The Aldine,"
Chestnut st. above 19th.
Evans, Miss Katherine,
1710 Spring Garden st.

Farnum, Mr. Edward J.,
1811 Walnut st.
Farnum, Mr. George,
1811 Walnut st.
Ferris, Miss Anna Jenkins,
3305 Race st.
Fischer, Mr. Chas. H.,
408 Stafford rd., Germantown.
Fisher, Mrs. H. H.,
1331 De Kalb st.,
Norristown, Pa.
Fisher, Mr. S. Wilson,
1502 Pine st.
Fisher, Mrs. S. Wilson,
1502 Pine st.
Fisher, Mr. Wm. Righter,
750 Drexel Building.
Fite, Miss Mary,
2236 Fitzwater st.

Garber, Miss Ida,
Bryn Mawr, Pa.
Garber, Miss Virginia W.,
Bryn Mawr, Pa.
Gaskill, Dr. J. Howard,
1629 Walnut st.
Gayley, Mr. Wm. T.,
6398 Drexel rd.,
Overbrook, Phila.
Gerry, Mrs. Fred'k R.,
37 South 19th st.
Gould, Mrs. George M.,
119 South 17th st.
Graham, Miss Emily L.,
1511 West Susquehanna ave.
Green, Miss Anna C.,
1607 Green st.
Green, Mr. Frank B.,
5904 Wayne ave., Germantown.
Griffith, Miss Mary C.,
1531 Locust st.
Griffith, Miss Mary D.,
3914 Walnut st.
Guilbert, Mr. C. H.,
839 Windsor sq.

Hallowell, Mrs. Sarah C. F.,
2017 De Lancey pl.
Hallowell, Miss Jean Fraley,
2017 De Lancey pl.
Harned, Mr. Wilfred H.,
223 South 42d st.
Hart, Mr. Byerly,
108 South 21st st.
Hart, Mr. Gavin W.,
Franklin Building,
12th and Walnut sts.
Hart, Mrs. Gavin W.,
Franklin Building,
12th and Walnut sts.
Haupt, Prof. Lewis M.,
107 North 35th st.
Hawley, Col. J. W.,
Media, Pa.
Head, Miss Harriet,
109 Chelten ave., Germantown.
Heilprin, Prof. Angelo,
Academy of Natural Sciences.
Heston, Mrs. Geo. T.,
Newtown, Bucks Co., Pa.
Hill, Mr. Thos. R.,
1618 Mt. Vernon st.
Hill, Mrs. Thos. R.,
1618 Mt. Vernon st.
Hoch, Dr. Wm. R.,
1811 Spring Garden st.
Hoch, Mrs. Wm. R.,
1811 Spring Garden st.
Holmes, Miss Mary S.,
1331 North 12th st.
Holmes, Mr. Joshua M.,
3330 North 20th st.

Holt, Dr. J. F.,
1935 Poplar st.
Hopkins, Miss Maude G.,
Drexel Institute.
Hovey, Mr. John G.,
"The Lindenwood,"
Radnor, Pa.
Huey, Miss Harriet J. Baird-,
1425 North 16th st.
Huneker, Mr. John F.,
1322 Chestnut st.
Hutchinson, Mr. Chas. Hare (life mem.),
1617 Walnut st.
Hutchinson, Mr. James Pemberton,
Newtown, Bucks Co., Pa.

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Chester, Pa.
Ives, Mr. James E.,
Clark University,
Worcester, Mass.

Jackson, Mr. J. T.,
1816 Chestnut st.
Janney, Mr. Nathaniel E. (life mem.),
608 Chestnut st.
Janney, Miss Susan W.,
1713 Green st.
Jenks, Mrs. Wm. H.,
2004 Arch st.
Jolliffe, Miss Elizabeth,
"The Aldine,"
Chestnut st. above 19th.
Jones, Mr. Horace C.,
"Hedgeley,"
Conshohocken, Pa.
Jones, Mrs. Horace C.,
"Hedgeley,"
Conshohocken, Pa.

Keely, Dr. Robt. N.,
1823 Vine st.
Keen, Miss Eliza L.,
1209 Arch st.
Keith, Mrs. Chas. P.,
321 South 4th st.
Kendrick, Mrs. Geo. W.,
3507 Baring st.
Kershaw, Mr. Wm. M.,
Penn st., Germantown.
Kimes, Miss L. E.,
2245 Franklin st.
Kinsey, Miss Mary M.,
2032 Green st.
Kirkbride, Dr. J. J.,
"The Aldine,"
Chestnut st. above 19th.
Kirkbride, Mrs. Thos. S.,
1406 Spruce st.
Klahr, Miss Mary S.,
607 North 6th st.
Knight, Mr. D. Allen (life mem.),
1129 Mt. Vernon st.
Koons, Miss Mary L.,
2004 Chestnut st.

Lea, Miss Nina,
2000 Walnut st.
Le Boutillier, Mr. Roberts,
East Washington ave.,
Germantown.
Le Boutillier, Mrs. Roberts,
East Washington ave.,
Germantown.
Le Boutillier, Mr. Theodore,
East Washington ave.,
Germantown.
Lewis, Mr. Harold R.,
1616 North 16th st.
Lewis, Mrs. Harold R.,
1616 North 16th st.
Lewis, Miss Julia L.,
250 South 16th st.
Libbey, Prof. W., Jr. (non-res.),
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3035 Diamond st.
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Riverton, N. J.
Lippincott, Mr. Henry G.,
Cinnaminson, N. J.

Lippincott, Mr. Howard White (life mem.),
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Logan P. O., Phila.
Lippincott, Mrs. J. B.,
Logan P. O., Phila.
Lippincott, Miss Susan W.,
Cinnaminson, N. J.
Lodge, Mrs. L. K.,
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Longcope, Mr. Thomas M.,
1810 Wallace st.
Longcope, Mrs. Thomas M.,
1810 Wallace st.
Longshore, Dr. Hannah E.,
214 West Logan sq.
Longstreth, Mr. Chas. A.,
1012 South 49th st.
Longstreth, Mrs. Chas. A.,
1012 South 49th st.
Longstreth, Mr. Edward,
1805 Spring Garden st.
Ludwig, Miss A. Blanche,
N. E. cor. 21st and Spruce sts.
Lyman, Mr. Benj. Smith,
708 Locust st.

Massey, Miss E. E.,
2018 Vine st.
Maule, Mr. Francis I.,
105 South 21st st.
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1505 North 15th st.
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4306 Market st.
McConnell, Mrs. S. D. (non-res.),
157 Montague st., Brooklyn, N. Y.
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2105 Tioga st.
McFadden, Mr. Fred'k,
15th and Tioga sts.
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2314 Aramingo st.
McLaughlin, Mr. W. H.,
2314 Aramingo st.

Meehan, Mr. Thos.,
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Mercer, Mr. George G.,
636 Drexel Building.
Mercer, Mr. Henry C.,
Doylestown, Pa.
Mercur, Mrs. James Watts,
Wallingford, Pa.
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854 North 41st st.
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314 South Broad st.
Miller, Miss K. B.,
623 Vine st.
Mohr, Mrs. John J.,
1611 North 15th st.
Monroe, Mr. Edwin Pear,
1537 Spring Garden st.
Morford, Miss Susan,
Bryn Mawr, Pa.
Morris, Mr. Chas.,
2223 Spring Garden st.
Morris, Mr. Harrison S.,
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Morris, Miss Kate,
2223 Spring Garden st.
Morton, Miss Helen K.,
1421 Chestnut st.
Mucklé, Col. M. Richards,
"Ledger" Building.
Murphy, Mrs. Wm.,
Care of Mr. Walter Landell Murphy,
Room 863 Broad St. Station,
P. R. R., Phila.
Myers, Dr. Jane V.,
Cynwyd, Pa.
Myers, Dr. T. D.,
1703 Locust st.

Neely, Mrs. T. B.,
2017 Diamond st.
Newbold, Mr. Clement B.,
Philadelphia Club.
Newbold, Mr. Wm. H.,
113 South 5th st.
Nichols, Miss Ida C.,
747 North 26th st.

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1530 North 10th st.
Nicholson, Dr. Maude L.,
1530 North 10th st.
Nicholson, Miss Rebecca E.,
1530 North 10th st.
Nolan, Dr. Edward J.,
Academy of Natural Sciences.

Orne, Miss S. B.,
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3809 Locust st.
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2012 Mt. Vernon st.
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15 South 21st st.
Rogers, Mr. Harry,
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Sartain, Dr. Paul J.,
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1825 Spruce st.
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Schaeffer, Mrs. Chas.,
1309 Arch st.
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823 North Broad st.
Shryock, Mrs. W. K. (life mem.),
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Haverford, Pa.
Stambach, Mrs. S. P.,
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2029 Spruce st.
Thompson, Mrs. Samuel S.,
2029 Spruce st.
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1931 Race st.

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125 North 10th st.
Watts, Mr. Harvey M.,
1346 Spruce st.
Wayne, Dr. Edward F.,
917 Clinton st.
Weimer, Mr. Albert B.,
512 Walnut st.
Weistling, Mr. E. A.,
307 Chestnut st.
Welles, Mr. Chas. S.,
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Wharton, Mrs. Jos.,
Milestown P. O., Phila.
Wharton, Mr. W. Rodman,
910 Clinton st.
Whitaker, Miss Cicily M.,
1340 Walnut st.
White, Mr. Chas. H.,
2026 North 12th st.
Wigton, Mrs. Wm. H.,
Bryn Mawr, Pa.
Wilford, Mrs. E. Burke,
1417 North Broad st.
Williams, Miss Anna W.,
634 North 12th st.
Williams, Dr. Edward H.,
500 North Broad St.
Williams, Mr. Henry S.,
328 South 16th st.
Williams, Dr. Talcott,
916 Pine st.
Wilson, Mr. Edward H.
3609 Baring st.
Wilson, Mrs. Edward H.,
3609 Baring st.
Wirgman, Mrs. Chas.,
1932 Spruce st.
Wistar, Dr. Thomas (life mem.),
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Wood, Mr. George,
1313 Spruce st.
Wood, Miss Helen Biddle,
1016 Spruce st.
Wood, Miss Ida,
2038 Spring Garden st.
Wood, Mr. Stuart,
1620 Locust st.
Wood, Mr. Walter,
1620 Locust st.
Wood, Mr. Wm. E.,
1933 Vine st.
Woodbridge, Mr. J. Edwards,
1401 Potter st.,
Chester, Pa.
Woodbridge, Mrs. J. Edwards,
1401 Potter st.,
Chester, Pa.
Woolman, Mr. Edward W.,
44 North 38th st.
Wright, Miss Eleanor E.,
4308 Frankford ave.
Wright, Miss Helen J.,
1934 Arch st.
Wright, Miss Mary,
4308 Frankford ave.

Yarnell, Mr. Ellis H.,
1004 Girard Building.
Young, Mr. Geo. W.,
Room 301, Betz Building.
Young, Mr. John Russell,
Congressional Library,
Washington, D. C.

Geographical Society

OF

PHILADELPHIA

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GEORGE H BUCHANAN AND COMPANY
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The Geographical Society of Philadelphia

Organized as the Geographical Club of Philadelphia

HISTORY

The inception of the Geographical Society of Philadelphia is found in a call for the organization of such association, bearing date of March 10, 1891.

A preliminary meeting of organization was held in the Academy of Natural Sciences on March 19th. It was then recommended that a Constitution and By-Laws be drafted for presentation at the next meeting.

On the 30th of the same month, in the hall of the Academy of Natural Sciences, on Logan Square, a preliminary meeting for the purpose of framing articles of association was held.

At this meeting Professor Heilprin was asked to take the chair, and Dr. Benjamin Sharp acted as Secretary. Provisional articles of association were submitted.

At a meeting held on April 20th, in the hall of the Academy of Natural Sciences, the articles of association framed at the last meeting were formally adopted, and Prof. Angelo Heilprin was elected President.

The broad purposes of the organization rapidly attracted to it the interest of the community, and before the close of November, 1891, 104 names had already been enrolled for membership. The first stated meeting was held in the new lecture hall of the Academy of Natural Sciences, on February 24, 1892, when the President read an opening address on the "Present Aspects of Geographical Study." Other addresses were delivered by Vice-President Edward H. Weil and by Dr. D. G. Brinton ("On the Relations of Earth to Man"). The stated and special meetings up to this date have been as follows:

April 6, 1892. Address by Mr. Henry Pettit: "Views of Nature in the Occident and in the Orient."

May 4, 1892. Address by Dr. Charles L. Mitchell: "The Geographical Aspects of Western Norway."

November 2, 1892. Address by President Heilprin: "The Arctic Problem and the Recent Explorations."

December 8, 1892. Address by Mr. E. S. Balch: "Mountain Exploration."

January 4, 1893. Address by Miss Laura Bell: "Characteristics of Constantinople."

February 1, 1893. Address by Mr. W. W. Rockhill: "Through Mongolia and Tibet."

March 1, 1893. Address by Prof. Spencer Trotter: "Animal Migration as Determined by Geographical Configuration."

April 5, 1893. Address by Dr. D. G. Brinton: "Modern Spain and its Culture."

May 4, 1893. Address by Dr. Charles Schäffer: "The Selkirk Mountains and the High Sierra of California."

November 1, 1893. Address by President Heilprin: "The Past and Future of Geographical Exploration."

December 6, 1893. Addresses and papers by Mr. W. H. Rau, "A Photographer among the Selkirk and Rocky Mountains of Canada," Miss Harriet J. Baird-Huey, "What to do in Japan" and Mr. Harold R. Lewis, "Taking Headers in Europe and Japan."

January 3, 1894. Address by Dr. Benjamin Sharp: "Two Months in Hawaii."

February 7, 1894. Addresses by Mr. Edwin Swift Balch: "The Japanese and their Painting;" Mr. F. Lynwood Garrison: "Geographical Distribution of Moose and Caribou in North America."

March 7, 1894. Addresses by Dr. F. A. Cook: "Shall the Antarctic Regions Remain a Blank upon our charts?"; Mr. Walter Wellman: "The Proposed Wellman Arctic Expedition of 1894."

April 4, 1894. Addresses by Prof. E. H. Williams, Jr.: "Lake Packer, Pennsylvania: An Episode in the Early Part of the Glacial Period;" Prof. Angelo Heilprin: "The Gorges and Waterfalls of Northeastern Pennsylvania."

May 2, 1894. Address by Mr. Sidney Dickinson, M. A., F. R. G. S.: "Picturesque New Zealand."

November 7, 1894. Address by Mr. Henry G. Bryant: "Preliminary Report on the Operations of the Peary Auxiliary Expedition of 1894."

December 5, 1894. Annual Address by the President, Prof. Angelo Heilprin: "The Progress of Discovery and the Lands of Promise to the Explorer."

January 2, 1895. Addresses by Mr. Talcott Williams: "The Mountains of North Carolina;" Mr. Thomas Willing Balch: "Some Facts about Alsace-Lorraine;" Dr. Henry Skinner: "Summering in the Maine Woods;" Mr. Henry C. Mercer: "Cave-Hunting in Pennsylvania."

February 6, 1895. Address by Dr. Emil Holub: "Experiences and Adventures in a Journey in South Africa."

March 6, 1895. Address by Mr. William E. Wood: "An Evening in Alaska and Norway."

April 3, 1895. Address by Gen. A. W. Greely: "The Oregon Trail, or the Exploration of Captain Bonneville."

May 1, 1895. Address by Mr. Thomas G. Allen, Jr.: "An Ascent of Mount Ararat."

November 6, 1895. Annual Address by the President, Mr. Edwin Swift Balch: "The Present Geographical Movement."

December 4, 1895. Address by Mr. Henry C. Mercer: "Cave Exploration in Yucatan."

January 8, 1896. Address by Civil Engineer Robert E. Peary, U. S. N.: "From Whale Sound to Independence Bay across the Great Ice."

February 5, 1896. Addresses by Mr. J. Edward Farnum: "A trip to Manika Land, Southeast Africa;" Mr. Theodore Le Boutillier: "With the Peary Relief Party to Bowdoin Bay."

March 7, 1896. Address by Dr. A. Donaldson Smith: "Explorations in Unknown East Africa, from Somaliland to Lake Rudolph."

April 1, 1896. Addresses by Mr. Joseph B. Austin: "The Orinoco Country and El Dorado;" Prof. Angelo Heilprin: "The Schomburgk Line."

April 15, 1896. Address by Mr. Joseph Wharton: "Volcanoes and the Eruption of Krakatoa."

May 6, 1896. Addresses and papers by Dr. Daniel G. Brinton: "The Rhine Delta;" Mr. Arthur C. Denniston: "A Winter Ascent of Mount Katahdin;" Miss Mary S. Holmes: "In the Neighborhood of Philadelphia."

November 4, 1896. Annual Address by the President, Prof. Angelo Heilprin: "Hungary and its People—a Pictorial Study and the Progress of a Nation."

December 2, 1896. Addresses by Mr. Henry G. Bryant, Mr. Amos Bonsall and Prof. Angelo Heilprin: "An Analysis of Nansen's Journey;" Dr. Henry Skinner: "Exhibition of Photographs of Roan and Grandfather Mountains and the Doe River Gorge, North Carolina."

January 6, 1897. Address by Mrs. Mabel Loomis Todd: "In Ainu Land with an Eclipse Expedition."

February 3, 1897. Address by Prof. Angelo Heilprin: "Across the Atlas Mountains and into the Sahara."

February 19, 1897. Address by Mr. Rudolph Blankenburg: "Japan and her People—Personal Observations."

March 3, 1897. Address by Mr. S. Hudson Chapman: "Greece and the Ægean Islands."

April 7, 1897. Address by Mr. George C. Thomas: "A Visit to Norway, the North Cape and Spitzbergen in the Summer of 1896."

April 21, 1897. Address by Dr. H. M. Hiller: "Borneo and its Inhabitants."

May 5, 1897. Address by Mr. Cyrus C. Adams: "Recent Discoveries in Africa."

November 3, 1897. Address by Mr. Henry G. Bryant: "Mountaineering in Alaska, including a Journey over Chilkoot Pass."

December 1, 1897. Address by Prof. Angelo Heilprin: "Mexico: Aspects of Nature in New Spain."

January 5, 1898. Address by Mr. F. W. Hodge: "Acoma and the Enchanted Mesa."

February 2, 1898. Address by Dr. Charles L. Mitchell: "Southern Tyrol and the Dolomite Alps."

March 2, 1898. Address by Mr. George Leiper Farnum: "From Peking to Vladivostock via the Khingan Mountains."

April 6, 1898. Address by Mr. Sidney Dickinson, M. A., F. R. G. S.: "Spain in its Glory and Decline; With an Account of the Moorish Occupation."

May 4, 1898. Addresses by Miss Maude G. Hopkins: "Among the Selkirks with Appalachian Mountain Club;" Prof. Angelo Heilprin: "A Winter Trip to the Grand Cañon of the Colorado."

November 2, 1898. Annual Address by President Henry G. Bryant: "Some Aspects of Modern Geography."

December 7, 1898. Address by Prof. Angelo Heilprin: "To Dawson and the Klondyke: Incidents of a Journey to the New Eldorado."

January 4, 1899. Address by Prof. Charles E. Fay: "Recent Mountaineering in the Canadian Rockies."

February 1, 1899. Address by Mr. E. A. McIlhenny: "Arctic Alaska: Its People and Resources."

February 16, 1899. Address by Mr. Raymon Reyes Lala (a native of Manila): "The Philippines and the Filipinos."

March 1, 1899. Addresses by Prof. Lewis M. Haupt: "The Nicaragua Canal: Topography and Geography of the Isthmus;" Prof. Lindley M. Keasbey: "The Terms and Tenor of the Clayton-Bulwer Treaty."

April 5, 1899. Address by Mr. Henry C. Mercer: "Tools of the American Pioneer."

May 3, 1899. Address by Prof. Robert T. Hill: "The Island of Porto Rico."

By a vote of the Club (at a meeting held December 2, 1896), acting on the recommendation of the Board of Directors, it was resolved to change the name of the organization into the Geographical Society of Philadelphia; the application for such change was granted by the Court of Common Pleas of Philadelphia, April 8, 1897.

As past history of the Society to the present date, should be mentioned its association, through a generous contribution of funds, with the Peary Arctic Expedition of 1893 and the Peary Auxiliary Expedition of 1894.

On February 2, 1896, the Haseltine Building, in which the Society had secured a room for use as a library, was destroyed by fire, and by it the Society lost its full possessions, including its books, the Charter, Bulletins and exchanges.

In the spring of 1899, an interesting experiment, known as the Melville-Bryant Drift Cask Project, to determine the direction and speed of Arctic currents, was successfully inaugurated by the Society.

The following "Bulletins" have been issued:

"Mountain Exploration," by Mr. Edwin Swift Balch; "A Journey to the Grand Falls of Labrador," by Mr. Henry G. Bryant; "The Progress of Discovery and the Lands of Promise to the Explorer," by Prof. Angelo Heilprin; "Some Facts about Alsace-Lorraine," by Mr. Thomas Willing Balch; "The Peary Auxiliary Expedition of 1894," by Mr. Henry G. Bryant; "A Trip to Manika Land," by Mr. J. Edward Farnum; "Venezuela's Territorial Claims" and "Notes on the Schomburgk Line and the Guayana Boundary," by Mr. Joseph B. Austin and Prof. Angelo Heilprin; "The Arctic Regions (map)," by Prof. Angelo Heilprin; "A Proposed System of Drift Casks to Determine the Direction of the Circumpolar Currents" and "The Drift of the *Jeanette*," by Commodore Geo. W. Melville, Engineer-in-Chief, U. S. N.

CHARTER

OF THE

Geographical Club (Society) of Philadelphia

BE IT KNOWN THAT, The subscribers, having associated themselves for the purpose of organizing the GEOGRAPHICAL CLUB OF PHILADELPHIA, and being desirous of becoming incorporated agreeably to the provisions of an Act of the General Assembly of the Commonwealth of Pennsylvania, entitled "An Act to provide for the Incorporation and Regulation of certain Corporations," approved the twenty-ninth day of April, A. D. 1874, and its supplements, do hereby declare and certify that the following are the purposes, objects, articles and conditions of their said association, for and upon which they desire to be incorporated:

I. The name of the proposed corporation is GEOGRAPHICAL CLUB OF PHILADELPHIA.

II. The purpose for which the corporation is formed is the advancement of the science of geography and of geographical studies and exploration, the recording of discoveries, the presentation of researches, and the accumulation of works on geography.

III. The place where the business of the corporation is to be transacted is the city of Philadelphia, State of Pennsylvania.

IV. The corporation is to exist perpetually.

V. The names and residences of the subscribers are as follows: Angelo Heilprin, 1417 North Sixteenth Street, Philadelphia; Edward H. Weil, 1720 Pine Street, Philadelphia; Edward H. Williams, Rosemont, Pa.; Henry G. Bryant, 2013 Walnut Street, Philadelphia; Mary Wager Fisher, Bryn Mawr, Pa.; F. Lynwood Garrison, Radnor, Pa.; Sarah C. F. Hallowell, 2017 DeLancey Place, Philadelphia; Daniel G. Brinton, 2041 Chestnut Street, Philadelphia; Edwin Swift Balch, 1412 Spruce Street, Philadelphia; Coleman Sellers, Jr., 410 North Thirty-third Street, Philadelphia; Anna Williams Dreer, 101 North Thirty-third Street, Philadelphia; George Gluyas Mercer, 641 North Sixteenth Street, Philadelphia; Frances May Bockius, 1901 North Logan Square, Philadelphia; Martha Bunting, 2000 Arch Street, Philadelphia; Mary Blakiston, 2042 Chestnut Street, Philadelphia; Gavin W. Hart, 1316 Spring Garden Street, Philadelphia; Benjamin Smith Lyman, 708 Locust Street, Philadelphia; Thomas Meehan, Chew Street, Germantown, Philadelphia; Edward J. Nolan, 825 North Twentieth Street, Philadelphia; Robert E. Peary, Washington, D. C; Benjamin Sharp, 317 North

Thirty-fifth Street, Philadelphia; Henry Skinner, 716 North Twentieth Street, Philadelphia; Albert B. Weimer, 1934 Wallace Street, Philadelphia.

VI. The officers of the corporation shall be a President, a First and Second Vice-President, a Recording Secretary, a Corresponding Secretary and a Treasurer, who, together with seven Directors, shall form the Board of Directors, to which shall be entrusted the management of the affairs of the corporation. The names of those chosen Directors for the first year are: Angelo Heilprin, President, 1417 North Sixteenth Street, Philadelphia; Edward H. Weil, First Vice-President, 1720 Pine Street, Philadelphia; Edward H. Williams, Second Vice-President, Rosemont, Pa.; Henry G. Bryant, Recording Secretary, 2013 Walnut Street, Philadelphia; Mary Wager Fisher, Corresponding Secretary, Bryn Mawr, Pa.; F. Lynwood Garrison, Treasurer, Radnor, Pa.; Edwin Swift Balch, 1412 Spruce Street, Philadelphia; Daniel G. Brinton, 2041 Chestnut Street, Philadelphia; Anna Williams Dreer, 101 North Thirty-third Street, Philadelphia; Sarah C. F. Hallowell, 2017 DeLancey Place, Philadelphia; Coleman Sellers, Jr., 410 North Thirty-third Street, Philadelphia; Mary Blakiston, 2042 Chestnut Street, Philadelphia; Albert B. Weimer, 1934 Wallace Street, Philadelphia.

VII. The corporation has no capital stock.

VIII. The yearly income from said corporation, other than that derived from real estate, will not exceed the sum of $50,000.

WITNESS our hands and seals this tenth day of April, Anno Domini One Thousand and Eight Hundred and Ninety-three.

ANGELO HEILPRIN,	[Seal]
EDWARD H. WEIL,	[Seal]
EDWARD H. WILLIAMS,	[Seal]
HENRY G. BRYANT,	[Seal]
ALBERT B. WEIMER,	[Seal]
F. LYNWOOD GARRISON,	[Seal]
GEORGE GLUYAS MERCER,	[Seal]
FRANCES MAY BOCKIUS,	[Seal]
MARTHA BUNTING,	[Seal]
MARY BLAKISTON,	[Seal]
GAVIN W. HART,	[Seal]
SARAH C. F. HALLOWELL,	[Seal]
D. G. BRINTON,	[Seal]
EDWIN SWIFT BALCH,	[Seal]
COLEMAN SELLERS, JR.,	[Seal]
MARY WAGER FISHER,	[Seal]
ANNA WILLIAMS DREER,	[Seal]
BENJ. SMITH LYMAN,	[Seal]
THOMAS MEEHAN,	[Seal]
EDW. J. NOLAN,	[Seal]
R. E. PEARY,	[Seal]
BENJ. SHARP,	[Seal]
HENRY SKINNER.	[Seal]

COMMONWEALTH OF PENNSYLVANIA, }
COUNTY OF PHILADELPHIA. } *ss:*

Before me, the subscriber, a Notary Public of the Commonwealth of Pennsylvania, residing in the city of Philadelphia, personally appeared Angelo Heilprin, Gavin W. Hart and George Gluyas Mercer, three of the subscribers to the foregoing certificate of incorporation, and in due form of law acknowledged the same to be their act and deed.

WITNESS my hand and official seal this tenth day of April, Anno Domini One Thousand Eight Hundred and Ninety-three.

[SEAL.] ALEXANDER DURBIN LAUER,
Notary Public.

COUNTY OF PHILADELPHIA, *ss:*

Filed in the Prothonotary's Office of the Court of Common Pleas, in and for said county, this tenth day of April, A. D. 1893.

C. P. No. 1, Mar. Term, 1893, No. 524.

WILLIAM B. MANN,
Prothonotary.

DECREE.

And now, this twenty-ninth day of April, A. D. 1893, the within Charter and Certificate of Incorporation, having been presented to me, a Law Judge of said county, accompanied by due proof of publication of the notice of this application, as required by the Act of Assembly and rule of Court in such case made and provided, I certify that I have examined and perused the said writing, and have found the same to be in proper form and within the purposes named in the first clause specified in Section Second of the Act of the General Assembly of the Commonwealth of Pennsylvania, entitled "An Act to provide for the Incorporation and Regulation of certain Corporations," approved April 29, A. D. 1874, and the supplements thereto, and the same appearing to be lawful and not injurious to the community, I do hereby, on motion of George Gluyas Mercer, Esquire, on behalf of the petitioners, order and decree that the Charter aforesaid be and the same is hereby approved, and that, upon the recording of the same and of this order, the subscribers thereto and their associates shall be a corporation by the name of GEOGRAPHICAL CLUB OF PHILADELPHIA, for the purposes and upon the terms therein stated.

F. AMEDEE BREGY,
Judge of Court of Common Pleas No. 1.

Recorded in the office for the Recording of Deeds, etc., in and for the County of Philadelphia, in Charter Book No. 19, page 302, etc.

WITNESS my hand and seal of office, this tenth day of November, A. D. 1893.

THOMAS GREEN,
Recorder of Deeds.

To the Honorable the Judges of the Court of Common Pleas, No. 2, of Philadelphia County:

The petition of the GEOGRAPHICAL CLUB of Philadelphia respectfully represents:

That it is an association incorporated as a corporation of the first-class under the provisions of the Act of April 29, 1874, entitled "An Act to Provide for the Incorporation and Regulation of Certain Corporations," and its supplements, and that its charter was duly granted by your Honorable Court on the 29th day of April, A. D. 1893, and is recorded in the office for the Recording of Deeds, etc., in and for the County of Philadelphia, in Charter Book No. 19, page 302, etc.

That, pursuant to the provisions of the Acts of Assembly, it is desirous of altering and amending its said charter in accordance with the action of the corporators, who, at a meeting regularly convened on the second day of December, 1896, adopted the following proposed changes therein, namely: That the first section of the said charter, which is as follows: "I. The name of the proposed corporation is GEOGRAPHICAL CLUB OF PHILADELPHIA," shall be amended to "I. The name of the proposed corporation is GEOGRAPHICAL SOCIETY OF PHILADELPHIA."

Your petitioner therefore prays your Honorable Court to order and decree that the amendment above specified be approved and made part of the charter of the said "GEOGRAPHICAL CLUB OF PHILADELPHIA."

IN WITNESS WHEREOF, the corporate seal of the said corporation has been hereto affixed, duly attested, this 20th day of February, 1897.

(Signed) ANGELO HEILPRIN, [SEAL]
President.

Attest:
(Signed) PAUL J. SARTAIN.

STATE OF PENNSYLVANIA,
COUNTY OF PHILADELPHIA, } *ss:*

On the 20th day of February, A. D. 1897, before me, the subscriber, a Notary Public for the Commonwealth of Pennsylvania, residing in the City and County of Philadelphia, personally appeared Angelo Heilprin, President of the above named corporation, who, having been duly affirmed according to law, did depose and say that he was personally present at the execution of the above petition, and saw the common seal of the said corporation of the "GEOGRAPHICAL CLUB OF PHILADELPHIA" duly affixed thereto, and that the seal so affixed is the common and corporate seal of the said "GEOGRAPHICAL CLUB OF PHILADELPHIA," and that the said petition was duly signed, sealed and delivered as and for the act and deed of

the said corporation to the intent and purposes therein mentioned, and that the name of the deponent subscribed thereto as President of the said corporation, in attestation of the due execution and delivery of the said petition, is of the deponent's own proper handwriting.

Affirmed and subscribed before me the day and year above named.

[SEAL] (Signed) GEO. E. NITZSCHE,
Notary Public.

DECREE.

And now, March 6, 1897, the within petition having been presented and read, and it appearing to the Court that the alteration and amendment, as therein prayed for, is lawful and beneficial, and not in conflict with the requirements of the Constitution or laws of this Commonwealth, it is therefore ordered that notice of the pending application be given, according to the provisions of the Acts of the General Assembly of the Commonwealth of Pennsylvania in such case made and provided.

By the Court:

(Signed) SAML. W. PENNYPACKER,
President Judge.

Geographical Society of Philadelphia

BY-LAWS

ARTICLE I

OBJECTS

The objects of the Society are

(1) The furtherance of the Science of Geography and the promotion of geographical studies generally.

(2) The interchange of experiences of travel at home and abroad.

(3) The recording of discoveries, and the presentation of researches by means of lectures, photographic and other exhibitions.

(4) The promotion of geographical exploration.

(5) The accumulation of works on geography and photographs of scenery and people.

ARTICLE II

MEMBERSHIP

There shall be four classes of membership:

(1) ACTIVE OR RESIDENT MEMBERS, who shall pay annual dues as fixed by the Board of Directors, and shall alone have the privileges of voting and holding office.

(2) NON-RESIDENT MEMBERS, who are those living more than seventy-five miles from Philadelphia. They shall pay one-half the annual dues, and shall be entitled to attend the Society meetings and to receive its publications. They may assume the privileges of Active members at any time on payment of full annual dues.

(3) CORRESPONDING MEMBERS, who may be chosen from the officers of other geographical or scientific societies and from those who have contributed to geographical knowledge, or are engaged in geographical exploration or other correlated scientific work.

(4) HONORARY MEMBERS. Only those who have distinguished themselves in the field of geographical knowledge or exploration shall be eligible to Honorary membership. The number of Honorary members shall not exceed twenty-five at any one time.

Corresponding and Honorary members shall be exempt from the payment of dues and shall have all the privileges of other members except those of voting and holding office.

Nominations for Active and for Non-resident membership shall be made by one member and seconded by two other members having personal knowledge of the nominee, whose qualifications for membership and sym-

pathy with the objects of the Society, as enumerated under Article I, must be stated in writing to the Board of Directors, who shall have the power to act on such nominations.

Corresponding and Honorary members may be elected by the unanimous vote of the Directors present at any Board meeting.

The annual dues shall be fixed by the Board of Directors, and shall not exceed $5, payable on or before the first day of January in each year. Members elected at the May and October meetings shall be assessed one-half the amount of the annual dues. Members elected in November and December shall not be assessed for dues until the January first following their election. Members whose dues are unpaid on April 1st shall be notified by the Treasurer, and any member in arrears six months after such notification may be suspended or dropped by the Board of Directors.

Any member or member-elect may become a Life member by the payment of fifty dollars, and in such case shall not be liable for further dues, and shall have the privileges and rights of an Active member. All payments for Life membership shall be invested to form a fund whose annual income shall be used for such purposes as the Society may hereafter direct.

ARTICLE III

SOCIETY MEETINGS

The Annual Meeting of the Society shall be held on the evening of the first Wednesday in November, at which meeting the President shall deliver an address on the progress of geographical discovery during the year, either general or special, or relating to special researches made in connection with geographical inquiry.

The other regular meetings of the Society shall be held monthly, on the evenings of the first Wednesday of each month from November to May, inclusive, unless otherwise ordered by the Board of Directors.

Each member shall be provided with a membership card, and the Resident members, in addition, with two invitation cards for each meeting, each card admitting but one person. It shall be within the discretion of the Board of Directors to issue additional cards, or to withhold, on special occasions, the supplemental cards. No person shall be admitted without a card, unless personally known to the attendant as a member.

Special meetings of the Society may be called by the Board at its discretion, and shall be called upon the written request of four members of the Board, addressed to the President. The proceedings of the Board of Directors shall be reported monthly to the Society.

ARTICLE IV

BOARD MEETINGS

Meetings of the Board of Directors for general business shall be held in each month from October to May, inclusive, on such day as the Board shall from time to time appoint and announce to the Society. Special meetings of

the Board may be called by the President at his discretion and shall be called by him at the written request of four members of the Board.

At all meetings of the Board seven members present shall constitute a quorum for the transaction of business.

Members of the Board of Directors who have absented themselves from three consecutive stated meetings of the Board, without the presentation of excuse for such absence, shall be considered to have forfeited their seats, and the places so left vacant shall be filled (by appointment) by the Board of Directors.

ARTICLE V

ANNUAL ELECTIONS

The Annual Election shall take place at the regular May meeting, when there shall be elected:

(1) The President, Vice-Presidents, Secretaries and Treasurer for the ensuing year.

(2) Three Directors, of whom two shall serve for two years and one for three years, the long term to be drawn by lot after the election.

(3) Four members of the Excursion Committee and four members of the Reception Committee for the ensuing year.

No person shall be eligible for the office of President or for the office of Vice-President for more than two consecutive years, nor shall Directors, elected as such, be eligible for consecutive terms of such service.

A Nominating Committee, to consist of five members of the Society, shall be appointed by the President at the March meeting of the Society, which committee shall report to the Society at its regular April meeting their nomination for Officers, Directors and Standing Committees of the Society; at which meeting also any five members may unite in presenting in writing an additional nomination for any office, provided such nominee has consented to serve, if elected, or may within one week after the April meeting send such nomination to the Recording Secretary by mail.

The election shall be by secret ballot, after the Australian method, on tickets furnished by the Board of Directors, containing in alphabetical order the names of all persons nominated for the respective offices, and having a blank space where the voter may write the name of any one not nominated for whom he may wish to vote. Each member shall mark his ticket with a cross (X) opposite the name of the person he desires to vote for. If a voter marks more names than there are persons to be elected to an office, or if, for any other reason, it is impossible to determine the voter's choice, his ballot shall not be counted for such office.

No member shall have the right to vote whose dues are in arrears at the time of the annual election.

ARTICLE VI

COMMITTEES

The President shall, at the April meeting of the Society, appoint an Auditing Committee, consisting of two Society members, whose duty it shall be to examine the Treasurer's accounts, determine their correctness and certify the same to the Society at its May meeting.

There shall be Standing Committees of the Society on Excursions and on Receptions, each consisting of four members elected by the Society and a Chairman appointed from the Board of Directors by the President.

The Standing Committees of the Board of Directors shall be:

(1) The Executive Committee.

(2) The Finance Committee.

(3) The Entertainment Committee.

(4) The Publication Committee.

The Executive Committee shall consist of the President, the two Vice-Presidents and the two Secretaries, whose duty it shall be to arrange for the stated meetings of the Society, and to prepare suitable programs for presentation at them.

The Finance Committee shall consist of three members, and shall have a general oversight of the receipts, expenditures and investments of the Society, and shall, before the October and February stated meetings of the Board, examine and certify the Treasurer's accounts and vouchers, and report to the Board at the said meetings the result of their examination and the amount of the cash balance in the Treasurer's hands.

The Entertainment Committee shall consist of at least three members, and shall include the ladies who may be members of the Board of Directors.

The Publication Committee shall consist of at least three members.

All necessary appointments to the Standing Committees shall be made by the President at the stated meeting of the Board in May.

Additional Standing Committees may be constituted hereafter by either the Society or the Board of Directors, as may be found expedient by them respectively.

ARTICLE VII.

PUBLICATIONS, PROFESSORSHIPS AND MEDALS

The publications of the Society shall be known as the BULLETIN OF THE GEOGRAPHICAL SOCIETY OF PHILADELPHIA, and shall contain matter referring only to geographical knowledge, or that which is pertinent to the interests of the Society. It shall be under the direction of the Publication Committee.

The Board of Directors shall have the power to create Honorary Professorships of Political and Historical Geography; Physical and Descriptive Geography; Anthropo-Geography; Military and Naval Geography; and Cartographical and Topographical Geography.

A medal, to be known as the Elisha Kent Kane Medal of the Geographical Society of Philadelphia, may be awarded annually by the Society, on the recommendation of the Board of Directors, to such person as may be designated by a three-fourths vote of the entire Board of Directors, and approved by the majority of the members present at the meeting, and only for important geographical exploration or research made during the twenty four months preceding the award. The award shall be made at the May meeting of the Society.

HONORARY MEMBERS

*Astrup, Mr. Eivind,
Christiania, Norway.
Daly, Hon. Charles P.,
84 Clinton Place,
New York, N. Y.
Dawson, Dr. Geo. M., C.M.G., F.R.S.,
Director of the Geological
Survey of Canada,
Ottawa, Canada.
Fielde, Miss Adele M.,
18 W. 43d St., New York, N.Y.
Greely, General A. W.,
Chief Signal Officer, U.S.A.,
Washington, D. C.
Holub, Dr. Emil,
Vienna, Austria.
Levasseur, Prof. E.,
Membre de l'Institut,
Paris, France.
Markham, Sir Clements, R., K.C.B.,
F.R.S., P.R.G.S.,
London, England.
Melville, Rear Admiral Geo. W.,
Engineer-in-Chief, U.S.N.,
Washington, D.C.
Nansen, Dr. Fridtjof,
Christiania, Norway.
Peary, Lieut. Robt. E.,
Civil Engineer, U.S.N.,
Washington, D.C.
Peary, Mrs. Robt. E.,
Washington, D.C.
Richthofen, Baron F. von,
Berlin, Germany.
Rockhill, Hon. William Woodville,
Washington, D.C.
Suess, Prof. Eduard,
Vienna, Austria.

* Deceased, December, 1895.

CORRESPONDING MEMBERS

Abbott, Dr. W. L.
Singapore.
Davidson, Prof. George,
University of California,
Berkeley, Cal.
Davis, Prof. Wm. M.,
Cambridge, Mass.
Fay, Prof. Charles E.,
Tufts College, Mass.
Fletcher, Prof. Jas., LL. D., F.R.S.C.,
F. L. S.,
Dominion Experimental Farms,
Ottawa, Canada.
Gannett. Mr. Henry,
U. S. Geological Survey,
Washington, D. C.
Keltie, Dr. J. Scott,
Secretary Royal Geographical
Society,
1 Savile Row,
London, England.
Mill, Dr. Hugh Robert,
Librarian Royal Geographical
Society,
1 Savile Row,
London, England.
Plummer, Mr. Fred. G.,
Tacoma, Washington.
Russell, Prof. Israel C.,
University of Michigan,
Ann Arbor, Mich.
Sella, Sig. Vittorio,
Biella, Italy.

ACTIVE MEMBERS

Aaron, Mrs. C. B.,
702 North 43d St.
Abbott, Mr. Francis R.,
406 South Broad St.
Abbott, Miss Gertrude,
1926 Chestnut St.
Adaire, Mrs. Alexander,
1414 Palmer St.
Alexander, Mrs. M. C. B.,
Ashbourne, Pa.
Allen, Mr. Thomas G., Jr.,
Haddonfield, N. J.
Armstrong, Mr. Theodore,
115 Chestnut St.,
Austin, Mrs. Esmond H.,
1622 Green St.
Bache, Mr. Richard Meade,
4400 Sansom St.
Bacon, Mrs. Josiah M.,
919 Clinton St.
Balch, Miss Elise Willing (life mem.),
1412 Spruce St.
Balch, Mr. Edwin Swift, (life mem.),
1412 Spruce St.
Balch, Mr. Thos. Willing (life mem.),
1412 Spruce St.
Baldwin, Miss Anna Goodwin,
Bryn Mawr, Pa.
Baldwin, Mr. E. B. (non-res.),
Planter's House,
411 Levee St., Cairo, Ill.
Baltz, Mr. Harry R.,
1813 Pine St.
Barker, Miss Dency M.,
1313 North 12th St.
Barker, Mr. Edward D.,
808 North 41st St.
Barlow, Mr. Thos. W.,
1012 Girard Building.
Barr, Mr. J. H. C.,
1729 Ridge Ave.
Barr, Mrs. J. H. C.,
1729 Ridge Ave.
Barrows, Mrs. Wm. Elliott,
2312 Spruce St.
Bartol, Mrs. E. J.,
1900 Spruce St.
Baugh, Mr. Daniel,
1601 Locust St.
Beale, Dr. Rupert G.,
1116 Girard St.
Beaux, Miss Cecilia,
4305 Spruce St.
Bell, Miss Emily,
1428 Spruce St.
Bell, Miss Laura,
1428 Spruce St.
Bergner, Mr. C. William,
1527 Walnut St.
Biddle, Mr. Wm. F.,
4305 Spruce St.
Bissey, Mrs. Herman S.,
1630 North 16th St.
Blakiston, Miss Maria S.,
3214 Woodland Ave.
Blakiston, Miss Mary,
2042 Chestnut St.
Bliem, Miss Jeannette,
1543 North 19th St.
Bockius, Miss Elizabeth,
1635 Arch St.
Bockius, Miss Frances May,
1635 Arch St.
Bonsall, Mr. Amos,
906 Walnut St.
Borden, Mr. H. Clay,
2030 Cherry St.
Bowen, Miss Augusta B.,
319 Springfield Ave.,
Wissahickon Heights,
Philadelphia.

Bowman, Miss Anne S.,
232 School Lane, Germant'n.
Boyer, Mr. Chas. S.,
3223 Clifford St.
Bradford, Dr. T. Hewson,
125 South 18th St.
Breadin, Miss Harriet,
3041 W. Susquehanna Ave.
Breed, Mr. J. Howard,
7 South 21st St.
Brinton, Dr. Daniel G.,
346 Washington St., Media, Pa.
Brodhead, Mr. L. W. (non-res.),
Delaware Water Gap, Pa.
Brodhead, Mrs. L. W. (non-res.),
Delaware Water Gap, Pa.
Brown, Miss Martha M. (life mem.),
1716 Walnut St.
Brinley, Mr. Chas. A.,
247 South 16th St.
Bryant, Mr. Henry G.,
2013 Walnut St.
Buckenham, Mr. J. E. Burnett,
Chestnut Hill, Phila.
Bullock, Mrs. Annie K.,
St. Joseph's Hospital
Bunting, Miss Martha,
Fiske Hall, Barnard College,
New York City, N. Y.
Burdette, Mr. Robt. J.,
Bryn Mawr, Pa.
Campbell, Miss Mary A.,
405 School Lane, Germantown
Chahoon, Mr. Jos. S.,
126 South 4th St.
Chahoon, Mrs. Jos. S.,
126 South 4th St.
Chandler, Mr. Alfred N.,
The Bourse, 5th St., front
Chapman, Mr. S. Hudson,
1212 Spruce St.
Chauncey, Mr. Charles,
251 South 4th St.
Clements, Mr. Alfred,
1624 Chestnut St.
Colket, Mr. C. Howard (life mem.),
519 Drexel Building.
Colket, Mrs. C. Howard,
519 Drexel Building.
Collier, Miss Elizabeth B.,
263 North 6th St.
Collins, Miss Sara C.,
4713 Windsor Ave.
Connell, Miss Hester C.,
3953 Baltimore Ave.
Converse, Col. Charles A.,
500 North Broad St.
Converse Mr. John A.,
Rosemont, Pa.
Converse, Mrs. John A.,
Rosemont, Pa.
Cook, Mr. E. S.,
809 North 24th St.
Cordery, Mrs. Deborah Leeds,
2119 North 15th St.
Cornish, Miss Frances,
1728 Chestnut St.
Cox, Mr. John Lyman.
2218 St. James Place.
Coxe, Miss Mary Clapier,
1302 Pine St.
Cramp, Mr. Charles H.,
507 South Broad St.
Cramp, Mr. Samuel H.,
1229 North Broad St.
Craven, Miss Laura,
2019 Columbia Ave.
Crosbie, Mrs. Harriet M.,
1535 North 12th St.
Crowell, Miss Emma L.,
Oak Lane, Phila.
Crozer, Mr. George K., Jr.,
2022 Walnut St.
Culin, Mr. Stewart,
University of Pennsylvania.
Cushman, Miss Ida,
1340 Walnut St.

Dallam, Mr. David E.,
N. E. cor. 7th and Walnut Sts.

Davis, Mr. Frank A.,
646 North 32d St.
Davis, Mr. Samuel M. (non-res.),
831 Lumber Exchange Bldg.,
Minneapolis, Minn.
Day, Mr. Frank Miles,
925 Chestnut St.
Day, Mrs. Frank Miles,
Philellena St., near Green.
Denniston, Mr. Arthur C.,
Bullitt Building.
Dickinson, Mr. Sidney,
1011 Chestnut St.
Donaldson, Mr. Francis Adams, Jr.,
4307 Spruce St.
Dorey, Mr. Wm. H.,
235 Race St.
Dornan, Mr. Robt.,
1505 North 16th St.
Dornan, Mrs. Robt.,
1505 North 16th St.
Douredoure, Mr. Bernard L.,
2203 Spring Garden St.
Douredoure, Miss Eveleen A.,
2203 Spring Garden St.
Dreer, Mr. Wm. F.,
714 Chestnut St.
Dreer, Mrs. Wm. F.,
714 Chestnut St.
Dunning, Dr. T. S.,
1328 North 15th St.

Eldridge, Mrs. G. Morgan,
1337 North Broad St.
Ellis, Mr. Joseph D.,
325 Walnut St.
Entrikin, Mr. Samuel J. (non-res.),
219 Chattanooga St.,
San Francisco, Cal.
Erben, Miss Helen,
The Aldine,
Chestnut St. above 19th.
Evans, Miss Katherine,
1710 Spring Garden St.

Falkenau, Mr. Arthur,
4602 Kingsessing Ave.
Falkenau, Mrs. Arthur,
4602 Kingsessing Ave.
Farnum, Mr. Edward J.,
911 Clinton St.
Farnum, Mr. George Leiper,
1811 Walnut St.
Felt, Mr. Alvin B.,
1509 Columbia Ave.
Ferris, Miss Anna Jenkins,
3305 Race St.
Finck, Mr. Edward B.,
1120 Girard St.
Fisher, Mrs. H. H.,
1331 De Kalb St.,
Norristown, Pa.
Fisher, Mr. S. Wilson,
1502 Pine St.
Fisher, Mrs. S. Wilson,
1502 Pine St.
Fisher, Mr. Wm. Righter,
Room 1012,
Stephen Girard Bldg.
Fite, Miss Mary,
2236 Fitzwater St.
Frotscher, Mr. Oscar,
3040 Diamond St.
Gamewell, Miss Anna,
Glen Mills, Pa.
Garber, Miss Virginia W.,
Bryn Mawr, Pa.,
Gaskill, Dr. J. Howard,
1629 Walnut St.
Gayley, Mr. Wm. T.,
6398 Drexel Road.
Overbrook, Phila.
Gerry, Mrs. Fred'k. R.,
37 South 19th St.
Gould, Mrs. George M.,
119 South 17th St.
Graham, Miss Emily L.,
1511 W. Susquehanna Ave.
Green, Mssi Anna C.,
1607 Green St.

Greene, Mr. Frank B.,
5904 Wayne Ave., Gtn.
Griffith, Miss Mary C.,
1531 Locust St.
Griscom, Mrs. Rodman E.,
Haverford, Pa.
Guilbert, Mr. C. H.,
839 Windsor Sq.
Guilbert, Mrs. C. H.,
839 Windsor Sq.

Hallowell, Mrs. Sarah C. F.,
2017 De Lancey Place.
Harper, Mr. Siddons,
27 Saunders Ave.
Hart, Mr. Byerly,
108 South 21st St.
Hart, Mr. Gavin W.,
Franklin Bldg.,
12th and Walnut Sts.
Hart, Mrs. Gavin W.,
Franklin Bldg.,
12th and Walnut Sts.
Haupt, Prof. Lewis M.,
107 North 35th St.
Hawley, Col. J. W.,
Media, Pa.
Head, Miss Harriet,
109 Chelten Ave., Germant'n.
Heilprin, Professor Angelo,
Academy of Natural Sciences.
Henderson, Mr. George,
Franklin Building,
12th and Walnut Sts.
Hewitt, Mr. Charles,
809 Spruce St.
Hill, Mr. Thos. R.,
1618 Mt. Vernon St.
Hill, Mrs. Thos. R.,
1618 Mt. Vernon St.
Hoch, Dr. Wm. R.,
531 North 18th St.
Hoch, Mrs. Wm. R.,
531 North 18th St.

Holmes, Miss Mary S.,
1331 North 12th St.
Holmes, Mr. Joshua M.,
3507 North 22d St.
Holt, Dr. Jacob F.,
1935 Poplar St.
Hopkins, Miss Maude G.,
Drexel Institute.
Hovey, Mr. John G.,
"The Lindenwood,"
Radnor, Pa.
Howell, Mr. Edward I. H.,
5218 Germantown Ave.
Huey, Miss Harriet J. Baird,
"The Lorraine,"
Broad and Fairm'nt Ave.
Huneker, Mr. John F.,
N.E. cor. 16th and Sansom Sts.
Hutchinson, Mr. Chas. H. (life mem.),
1617 Walnut St.
Hutchinson, Mr. James Pemberton,
Newtown, Bucks Co., Pa.

Irving, Mr. Wm. A.,
Chester, Pa.
Irwin, Mrs. James,
2010 Park Ave.

Jackson, Mr. J. T.,
1816 Chestnut St.
Janney, Mr. Nathaniel E. (life mem.),
Land Title Building,
Broad and Chestnut Sts.
Janney, Miss Susan W.,
1713 Green St.
Jenks, Mrs. Wm. H.,
2004 Arch St.
Johnson, Mr. Alba B.,
Rosemont, Pa.
Johnson, Mrs. Alba B.,
Rosemont, Pa.
Jolliffe, Miss Elizabeth,
"The Aldine,"
Chestnut St., above 19th.

Jones, Mr. Horace C.,
"Hedgeley,"
Conshohocken, Pa.
Jones, Mrs. Horace C.,
"Hedgeley,"
Conshohocken, Pa.

Keely, Dr. Robt. N.,
1823 Vine St.
Keen, Miss Eliza L.,
1209 Arch St.
Keith, Mrs. Chas. P.,
321 South 4th St.
Kelly, Mr. Wm. D.,
Cliveland Ave., Germantown.
Kendrick, Mrs. George W.,
3507 Baring St.
Kershaw, Mr. William,
20 E. Penn St., Germantown.
Kimes, Miss L. E.,
2245 Franklin St.
Kinsey, Miss Mary M.,
2029 De Lancey Place,
Kirkbride, Mrs. Thos. S.,
1406 Spruce St.
Klahr, Miss Mary S.,
607 North 6th St.
Klemm, Mrs. George F.,
1618 Jefferson St.
Kneedler, Mr. Lorenz S.,
14 South Broad St.
Knight, Mr. D. Allen (life mem.),
1129 Mt. Vernon St.
Koons, Miss Mary L.,
2004 Chestnut St.

Lea, Miss Nina,
2000 Walnut St.
Le Boutillier, Mr. Roberts,
East Washington Ave.,
Germantown.
Le Boutillier, Mrs. Roberts,
E. Washington Ave.,
Germantown.
Le Boutillier, Dr. Theodore,
1625 Diamond St.
Lehman, Miss Emily,
1718 Arch St.
Lewis, Mrs. Harold R.,
1616 North 16th St.
Libbey, Prof. W., Jr. (non-res.),
Princeton, N. J.
Lindsay, Dr. Roland S.,
3035 Diamond St.
Lippincott, Miss H.,
Riverton, N. J.
Lippincott, Mr. Henry H.,
Cinnaminson, N. J.
Lippincott, Mr. Howard White
(life mem.), 1713 Green St.
Lippincott, Mr. J. B.,
Logan P. O., Philadelphia.
Lippincott, Mrs. J. B.,
Logan P. O., Philadelphia.
Lippincott, Miss Susan W.,
Cinnaminson, N. J.
Livezey, Mr. Maurice P.,
246 West Walnut Lane, G't'n.
Lodge, Mrs. L. K.,
Media, Pa.
Lombaerts, Mr. Edmond (non-res.),
Antwerp, Belgium.
Longcope, Mr. Thomas M.,
1810 Wallace St.
Longcope, Mrs. Thomas M.,
1810 Wallace St.
Longshore, Dr. Hannah E.,
214 West Logan Square.
Longstreth, Mr. Chas. A.,
Bryn Mawr, Pa.
Longstreth, Mrs. Chas. A.,
Bryn Mawr, Pa.
Longstreth, Mr. Edward,
1410 Spruce St.
Longstreth, Miss Helen G.,
1316 Spruce St.
Ludwig, Miss A. Blanche,
N.E. cor. 21st and Spruce Sts.

Lybrand, Mr. Wm. M.,
601 Stephen Girard Building.
Lyman, Mr. Benj. Smith,
708 Locust St.

Massey, Miss E. E.,
2018 Vine St.
Maule, Mr. Francis I.,
105 South 21st St.
Maybin, Miss Elizabeth S.,
1505 North 15th St.
McAllister, Dr. Anna M.,
3626 Hamilton St.
McConnell, Mrs. S. D. (non-res.),
157 Montague St.,
Brooklyn, N. Y.
McFadden, Mr. Fred'k M.,
1328 Spruce St.
McLaughlin, Mr. Robt. J.,
2243 Franklin St.
McLaughlin, Mr. W. H.,
2243 Franklin St.
Meehan, Mr. Thos.,
Germantown, Philadelphia.
Mercer, Mr. George Gluyas,
601 Drexel Building.
Mercer, Mr. Henry C.,
Doylestown, Pa.
Mercur, Mrs. James Watts,
Wallingford, Pa.
Middleton, Miss Mary L.,
854 North 41st St.
Miles, Mr. Edward S.,
314 South Broad St.
Mitchell, Dr. Chas. L.,
112 North 34th St.
Mohr, Mrs. John J.,
1611 North 15th St.
Monroe, Mr. Edwin Pear,
1537 Spring Garden St.
Morris, Mr. Chas.,
2223 Spring Garden St.
Morris, Mr. Harrison S.,
Milestown P. O., Philadelphia.
Morris, Miss Kate,
2223 Spring Garden St.
Mucklé, Col. M. Richards,
1722 Pine St.
Murphy, Mr. Walter L.,
2011 Green St.
Murphy, Mrs. Wm.,
c/o Mr. Walter L. Murphy,
Room 863 Broad St. Sta.,
P.R.R., Philadelphia.
Myers, Dr. Jane V.,
Cynwyd, Pa.
Myers, Dr. T. D.,
1703 Locust St.

Nash, Mrs. Wm. H. (non-res.),
727 Carroll St., Brooklyn, N.Y.
Neely, Mrs. T. B.,
2017 Diamond St.
Newbold, Mr. Clement B.,
1313 Locust St.
Newbold, Mr. Wm. H.,
113 South 5th St.
Nichols, Miss Ida C.,
747 North 26th St.
Nicholson, Mr. John L.,
1530 North 10th St.
Nicholson, Dr. Maude L.,
1530 North 10th St.
Nicholson, Miss Rebecca E.,
1530 North 10th St,
Nolan, Dr. Edward J.,
Academy of Natural Sciences.

Orne, Mrs. S. B.,
30 South 34th St.

Paul, Mr. James W., Jr.,
3809 Locust St.
Paul, Mr. J. Rodman,
903 Pine St.
Pearsall, Miss Henrietta W.,
1615 Arch St.
Peart, Miss Caroline,
1901 North Logan Square.

Peart, Mrs. John,
1901 North Logan Square.
Perot, Mrs. Effingham,
Ardmore, Pa.
Pettit, Mr. Henry,
Overbrook Farms, Phila.
Pollock, Mrs. James,
1408 Spruce St.
Prichard, Miss Margaret S.,
129 West Coulter St., G't'n.

Rawle, Mr. Wm. Brooke,
230 South 22d St.
Reilly, Mr. Garrett,
2015 De Lancey Place.
Reilly, Mr. John, Jr.,,
2015 De Lancey Place.
Remington, Dr. Jos. P.,
1832 Pine St.
Rex, Miss Mary S.,
901 Swede St., Norristown, Pa.
Richards, Mr. Thomas J.,
409 Chestnut St.
Rittenhouse, Mr. Jos. G.,
611 Philadelphia Bourse
Roberts, Mr. Chas. (life mem.),
1716 Arch St.
Roberts, Mrs. Chas.,
1716 Arch St.
Roberts, Mr. Hiram C.,
3320 North 17th St.
Robertson, Mr. A. D.,
Ridley Park, Pa.
Robinson, Mr. A. W.,
1926 Race St.
Robinson, Dr. W. D.,
2012 Mt. Vernon St.
Robinson, Mr. V. Gilpin,
235 South 21st St.
Rogers, Mr. Frank G.,
15 South 21st St.
Rogers, Mr. Harry,
2216 DeLancey Place.
Rosengarten, Mr. Jos. G.,
1704 Walnut St.
Rothermel, Mrs. P. F., Jr.,
2013 Walnut St.
Rotzell, Dr. W. E.,
Narbeth P. O., Pa.
Rowland, Mrs. Wm. N.,
1514 Green St.

Sartain, Miss Amy,
212 West Logan Square.
Sartain, Dr. Paul J.,
212 West Logan Square.
Sayres, Mr. Edward S.,
1825 Spruce St.
Schäffer, Dr. Chas.,
1309 Arch St.
Schäffer, Mrs. Chas.,
1309 Arch St.
Scott, Miss Aldyth,
1709 North 17th St.
Scott, Mr. Charles P. G.,
Radnor, Pa.
Scott, Mr. Norris J.,
Moylan, Delaware Co., Pa.
Scott, Miss S. M.,
118 South 13th St.
Serrill, Mr. Wm. J.,
Haverford, Pa.
Shallcross, Miss Elizabeth B.,
4625 Frankford Ave.
Shanahan, Rt. Rev. J. W.,
Harrisburg, Pa.
Sharples, Mrs. Walter Morgan,
Media, Delaware Co. Pa.
Shryock, Mr. Allen (life mem.),
1129 Mt. Vernon St.
Shryock, Mr. W. A. (life mem.),
823 North Broad St.
Shryock, Mr. W. K. (life mem.),
823 North Broad St.
Shryock, Mrs. W. K. (life mem.),
S.E.cor.Broad and Parrish Sts.
Skinner, Dr. Henry,
Academy of Natural Sciences.
Skinner, Mrs. Henry,
716 North 20th St.

Smaltz, Mrs. Jos. E.,
1522 North 16th St.
Snively, Rev. S. E.,
63d and Market Sts.
Snyder, Mr. John M.,
1628 Allegheny Ave.
Stambach, Mr. S. P.,
Haverford, Pa.
Stetson, Mrs. David S.,
2323 DeLancey Place.
Stokes, Mr. F. W.,
1122 Walnut St.
Stotesbury, Mr. Wm. A.,
Upland, Delaware Co., Pa.
Sweatman, Miss Rachel,
1508 Green St.

Taylor, Mr. Chas. M., Jr.,
"The Gladstone,"
11th and Pine Sts.
Taylor, Mrs. Chas. M., Jr.,
"The Gladstone,"
11th and Pine Sts.
Tenbrook, Mrs. Wm. H.,
1436 Poplar St.
Thomas, Mr. George C.,
Drexel Building.
Thompson, Mr. Samuel S.,
2029 Spruce St.
Tilney, Mr. Robert,
406 School Lane, Germantown.
Tower, Hon. Charlemagne, Jr.,
228 South 7th St.
Tryon, Miss Adeline S.,
1931 Race St.
Twining, Miss Edith,
1517 Marshall St.

Van Gasken, Dr. Frances,
S. E. Cor. 12th and Spruce Sts.
Vaux, Mr. George, Jr.,
404 Girard Building.

Walter, Miss Naomi,
109 North 16th St.
Wardle, Mrs. E. L.,
125 North 10th St.
Watts, Mr. Harvey M.,
1346 Spruce St.
Wayne, Dr. Edward F.,
917 Clinton St.
Weimer, Mr. Albert B.,
512 Walnut St.
Weistling, Mr. E.,
307 Chestnut St.
Welles, Mr. Chas. S.,
Elwyn, Pa.
Wetherill, Dr. H. Emerson,
U. S. A. (non-resident), care of
Surgeon General's Office,
Washington, D. C.
Wharton, Mr. Jos.,
P. O. Box 1332, Phila.
Wharton, Mrs. Jos.,
Milestown, P. O., Phila.
Wharton, Mr. W. Rodman,
910 Clinton St.
Whitaker, Miss Cecily M.,
1340 Walnut St.
Wigton, Mrs. Wm. H.,
Bryn Mawr, Pa.
Williams, Miss Anna W.,
634 North 12th St.
Williams, Dr. Edward H.,
500 North Broad St.
Williams, Mr. Ellis D.
526 Drexel Building.
Williams, Mrs. Ellis D.
309 South 15th St.
Williams, Mr. Henry S.,
328 South 16th St.
Williams, Dr. Talcott,
916 Pine St.
Wirgman, Mrs. Chas.,
2021 Pine St.
Wistar, Mrs. Jones,
1819 Walnut St.
Wistar, Dr. Thomas (life mem.),
23 South 16th St.

Wood, Miss Helen Biddle,
1016 Spruce St.
Wood, Miss Ida,
2038 Spring Garden St.
Wood, Mrs. Randolph,
N.W. Cor. 21st and Chestnut. Sts.
Wood, Mr. Stuart,
1620 Locust St.
Wood, Mr. Walter,
1620 Locust St.
Wood, Mr. Wm. E.,
1933 Vine St.
Woodall, Mr. John,
142 North 18th St.
Woodbridge, Mr. J. Edwards,
1401 Potter St., Chester Pa.
Woodbridge, Mrs. J. Edwards,
1401 Potter St., Chester, Pa.
Woolman, Mr. Edward W.,
44 North 38th St.
Wright, Miss Eleanor E.,
4308 Frankford Ave.
Wright, Miss Helen J.,
1934 Arch St.
Wright, Miss Mary,
4308 Frankford Ave.

Yarnall, Miss Anna,
1227 Spruce St.
Yarnall, Mr. Ellis H.,
1004 Girard Building
Young, Mr. Geo. W.,
902 Crozer Building.